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Site Baseline Sampling Work Plan

Former Vicksburg Chemical Company
Vicksburg, Mississippi

10 January 2007

ARCADIS

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Former Vicksburg Chemical Company
Vicksburg, Mississippi

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1. Introduction and Work Plan Rationale

1.1 Objectives/Rationale

This Work Plan presents a scope of work for performing sampling activities at the former Vicksburg Chemical Company (Vicksburg Chemical). The site was formerly a pesticide and herbicide manufacturing facility divided into two areas called the North Plant and South Plant. The primary objective of the activities proposed in this document will be to collect and evaluate soil, groundwater, and storm water data in accordance with the Mississippi Department of Environmental Quality (MDEQ) Brownfields program. Soil, groundwater, and storm water data will be acquired to further define present site conditions and to determine the regulatory and remediation paths forward.

All investigative sampling proposed in this Work Plan will be conducted in accordance with MDEQ's Brownfields program. MDEQ Brownfields Tier 1 Target Remediation Goals (TRGs) will be used as actionable standards. Waste characterization and disposal will be completed in accordance with MDEQ-approved methodology specific to this site. The use of MDEQ Brownfields investigative procedures and corrective action standards is appropriate in this investigation.

1.2 Property Background

1.2.1 Property Location

Vicksburg Chemical was formerly owned by Cedar Chemical Corporation (Cedar Chemical). The facility is located south of Interstate 20 on Rifle Range Road and within the southwest section of the city of Vicksburg, Warren County, Mississippi. The site is composed of approximately 535 acres located in Sections 4, 5, 8, 9, and 10, township 15 north, range 3 east (Latitude: North 32° 18' 01", Longitude: West 90° 53' 57"). The site location is shown on Figure 1.

1.2.2 Property History

The North Plant began operation in 1961 and produced potassium nitrate, liquid chlorine, and liquid nitrogen tetroxide. The raw materials for the North Plant included potassium chloride and nitric acid. The South Plant began operation in 1953 manufacturing chlorinated pesticides, nitrogen-based herbicides, and other agricultural chemicals. The only active operations at the South Plant after 1992 were the nitric acid

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unit constructed in 1986 and a potassium carbonate unit constructed in 1994. During various periods prior to 1987, the South Plant produced dinitro butyl phenol (dinoseb or DNBP), monosodium methane arsenate (MSMA) diethyl hexyl phosphoric acid (DEHPA), 1-hydroxy-ethylidene-1-1-diphosphonic acid (UNIHIB), toxaphene, methyl parathion, cyanazine (bladex), and atrazine. Toxaphene and methyl parathion are insecticides, while atrazine, dinoseb, and MSMA are herbicides. Raw materials for these operating processes included chlorine, camphene, ortho-secondary butyl phenol (OSBP), sodium arsenate, sodium hydroxide, methyl chloride, sulfuric acid, sodium paranitrophenolate, and phosphorus trichloride.

Originally, the two plants were completely separate, owned and operated by two different companies. The South Plant was originally constructed by Spencer Chemical in 1953. American Metal Climax Corporation (Amax) constructed the North Plant in 1961. After purchasing the South Plant in 1964, Gulf Chemical added a formaldehyde unit in 1966. According to historical environmental documents, Vicksburg Chemical was formed in early 1972 and purchased both the Gulf Oil and Amax facilities (except the formaldehyde plant) in July 1972. In 1978, Vicksburg Chemical was merged into Vertac, Inc., which merged into Vertac Chemical Corporation (VCC) in September 1979. Cedar Chemical acquired the Vicksburg Chemical plant from VCC in February 1986. Fermenta A.B. of Sweden acquired Cedar Chemical in June 1986. Nine West Corporation (Trans Resources, Inc.) acquired Cedar Chemical in January 1988.

In addition to the above-mentioned operations at the plant, the property was the location of two additional operations: 1) an operation by Reagent Chemical to produce aqueous hydrochloric acid from a by-product of the toxaphene operation; and 2) the Gulf formaldehyde plant. The formaldehyde unit owned and formerly operated by Borden Chemical is located inside the former boundary of the South Plant.

1.3 Project History and Detailed Summary of Previous Investigation Activities

Vicksburg Chemical initiated a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) in 1994 and continued through 2001. The *RCRA Facility Investigation Draft Final Report* and *Draft Groundwater Assessment Report* were completed in August 2001 and November 2001, respectively. Both reports were submitted to the U.S. Environmental Protection Agency (USEPA) and subsequently approved in December 2001. A draft Corrective Measures Study was developed in the spring of 2002.

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On March 8, 2002, VCC and Cedar Chemical filed for bankruptcy in the United States Bankruptcy Court for the Southern District of New York. The bankruptcy was contested by MDEQ, the Arkansas Department of Environmental Quality, USEPA Region 4, USEPA Region 6, and the U.S. Department of Justice. The court eventually approved an agreement allowing Vicksburg Chemical to abandon its properties and authorizing MDEQ to direct the transfer of the Vicksburg Chemical property to any entity identified by MDEQ. Since that time, MDEQ has kept the site under its control while structuring an agreement to clean up the plant site in a manner protective of human health and the environment. On December 19, 2005, MDEQ finalized an agreement for Mississippi Silvertip Development, LLC (Silvertip), to remediate the abandoned Vicksburg Chemical site. The developer, Silvertip, intends to create a Mississippi Bluffs Industrial Park to foster the sustainable reuse of the former chemical plant site and adjacent areas. It is anticipated that mixed use (i.e. light industrial, commercial, recreational, and residential) will be possible at the completion of the remedial action. Harcros Chemicals, Inc., is currently leasing portions of the former North Plant to facilitate a chemical blending, mixing, and distribution facility. Concurrently, ARCADIS G&M, Inc. (ARCADIS), is performing the remediation services with MDEQ oversight and control. Silvertip plans to construct high-end commercial and residential sites and a championship golf course on a majority of the remaining acreage.

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1.4 Data Needs and Objectives

Additional site data are needed to sufficiently characterize soil contaminant boundaries for remediation purposes, to ascertain present groundwater contaminant concentrations, and to evaluate baseline storm water quality. Data collected as part of the RFI process have been used to select the additional sample locations and are considered valid and usable. The objective of this sampling effort is to collect soil, groundwater, and storm water samples representative of present site conditions that will define the overall remediation strategy for this site.

1.5 Work Plan Approach

The general Work Plan strategy was developed to obtain data representative of present site conditions. Since Vicksburg Chemical declared bankruptcy in 2002, the site has not been regularly investigated or maintained. The most recent soil and groundwater data on overall site conditions available to ARCADIS are contained in the RFI and supplemental investigations. This Work Plan is based in large part on the analytical data presented in the *RCRA Facility Investigation*

Draft Final Report (URS 2001a), *Draft Groundwater Assessment Report* (URS 2001b), and other reports that pertain to the project area. The analytical data contained in these reports were compared to the February 28, 2002, MDEQ Brownfields Tier 1 TRGs for soil and groundwater. The soil concentrations, with the exception of arsenic concentrations, were compared to Tier 1 TRGs for restricted sites as chemical of concern (CoC) concentrations at this site. Arsenic concentrations were compared to the 95 percent Upper Confidence Limit of the mean of the background concentration as presented in the *Quality Assurance Project Plan* (QAPP; ARCADIS 2006a). The soil and groundwater results obtained from the implementation of this Work Plan will help to determine if the site conditions have significantly changed since the last investigations.

The purpose of the storm water sampling is to evaluate if site CoC are present in storm water. If the storm water does contain CoC at unacceptable concentrations, treatment prior to discharge may be required. Areas likely to receive storm water in the form of sheet flow and sumps that historically collected storm water will be sampled during a rainfall event to provide the necessary baseline data.

While in operation, the Vicksburg Chemical plant operated under a State of Mississippi Water Pollution Control permit (Permit No. MS0027995). Storm water was discharged under this permit to the Mississippi River. The sampling parameters contained in the former Water Pollution Control permit are incorporated into the storm water sampling program.

2. Field Operations

2.1 Source Areas Characterization

Data presented in the RFI indicated five main impacted areas. These areas were defined in the QAPP as four distinct areas in the South Plant and one in the North Plant. The areas were designated:

- Area 1 – South Plant – Solid Waste Management Units (SWMUs) 1, 5, 7, 8, 9, 11, 12, 14, 15, 16, and 17;
- Area 2 – South Plant – Portion of Southwest Corner SWMU 20;
- Area 3 – South Plant – SWMU 2;

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- Area 4 – South Plant – Part of SWMU 20 Bounded by MW-1, MW-13, and MW-14; and
- Area 5 – North Plant Pond – SWMU 23.

Each area contains CoC concentrations that exceed the MDEQ Tier 1 TRGs. Tables 1 and 2 list the sample designations where CoC concentrations exceed MDEQ Tier 1 TRGs in soil and groundwater, respectively.

The areal extent of surficial impacts, potential source areas for storm water contamination, has not been completely defined. One of the goals of this baseline sampling is to identify potential storm water contaminant source areas. Data may be used to redirect storm water from these areas to minimize the need for treatment prior to discharge.

2.2 Sampling Requirements

Some of the tasks that will be conducted during sampling activities have been outlined in detail in the QAPP. The pertinent sections are listed below and incorporated by reference.

2.2.1 Sampling Equipment and Procedures

Soil samples will be collected using direct push technology (Geoprobe®) and/or hand auger equipment. The proper use of these items in the collection of samples representative of site conditions is detailed in Sections 11.2 (Soil Boring/Sampling Geoprobe® Device) and 11.3 (Soil Sampling – Hand Auger) in the QAPP. Groundwater samples will be collected using low-flow purging techniques or with a bailer as described in Section 11.6 (Groundwater Sampling Procedures) in the QAPP. Storm water samples will be collected in accordance with the procedures described in Section 10.6 (Sample Collection Protocols) in the QAPP.

2.2.2 Sample Handling and Analysis

Sample handling and analysis were discussed in detail in Sections 10 and 11 of the QAPP. These procedures will be followed during the implementation of this Work Plan. Table 6 (Summary of Methods, Containers, Preservatives, and Holding Times) of the QAPP contains information relative to specific analyses. This table was revised to include additional storm water parameters not included in the original table. The

following parameters were added: Total Phosphorus (as P) and Fluoride (as F). The revised table is included as Table 3 of this Work Plan.

2.2.3 Quality Assurance/Quality Control (QA/QC) Samples

Appropriate QA/QC samples will be prepared in accordance with the procedures outlined in Section 10.12 (Field Quality Control Samples) of the QAPP. The QA/QC samples will include:

- Field blanks;
- Equipment rinsate blanks;
- Duplicate samples; and
- Matrix spike/matrix spike duplicate samples.

QA/QC samples will be collected at a frequency of 1 per each 20 samples of each matrix. Trip blanks will be included in ice chests used to transport the samples to the receiving laboratory. The sampling personnel will complete a chain-of-custody form that will accompany the samples to the laboratory.

2.3 Extent of Contamination in Soil

Soil contamination at the site has been extensively investigated through the RFI process. Due to the nature of the proposed remedies for soil contamination (capping, solidification, stabilization, landfilling), the horizontal delineation of CoC boundaries is critical. To adequately provide sufficient protection of human health and the environment, soil samples will be collected from the locations shown on Figure 2 to confirm and more precisely locate contaminant boundaries. The results of the soil sampling will be used in the development of the final remedy for each area.

2.3.1 Soil Sampling and Analysis Plan (SAP)

A Geoprobe® sampling unit will be used to advance probeholes for the collection of subsurface data at each of the sampling locations depicted on Figure 2. The Geoprobe® is a preferred technique for subsurface sampling in shallow unconsolidated materials because it minimizes the generation of soil cuttings and the introduction of foreign fluids into the probehole.

All drilling equipment will be properly decontaminated prior to advancing each probehole. This will be accomplished by thoroughly cleaning the Geoprobe® drive assembly to remove all soil residues.

The probehole at each location will be advanced and sampled to a depth sufficient to complete delineation of surface and subsurface impacts.

Soil samples will be continuously collected from land surface to total depth (estimated to be less than 12 feet below ground surface (ft bls) based on previous RFI data), as each probehole is being advanced. As each soil sample is retrieved to land surface, the sampling tube will be cut open and the sample removed (sampling personnel will wear clean gloves when handling each sample). The sides of the core will be trimmed away with a decontaminated stainless steel knife to allow for the collection of an undisturbed sample. The sample will be used to fill the appropriate laboratory-provided sample containers. Samples collected for the analysis of volatile organic compounds (VOCs) will be collected by USEPA SW-846 Method 5035. All sample containers will be labeled and placed into an ice bath within an insulated ice chest.

Any remaining soil sample will be inspected and described by an experienced field geologist with all relevant data (i.e., soil type, lithology, color, physical characteristics, moisture content, and any observed evidence of contamination) recorded onto a Sample/Core Log prepared for each probehole. The Sample/Core Log will present a complete description of the soil lithology encountered from land surface to the total depth of the probehole. Appendix A includes an example of the Sample/Core Log.

The samples will be submitted to the laboratory under proper chain-of-custody protocols. Selected parameters will be analyzed in accordance with the data presented in Table 3 specific to each analysis. At a minimum, the soil samples will be analyzed for the analytical parameters proposed in Table 4 and the VOCs contained in Appendix IX of 40 Code of Federal Regulations Part 264, or an analytical parameter set provided by MDEQ.

Soil samples collected from the following intervals in each probehole will be retained for chemical analyses:

- The soil sample collected from land surface to 2 ft bls;
- The soil sample collected from 2 to 4 ft bls; and

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- A sample from any obvious stained intervals below 4 ft bls if the 2- to 4-ft bls sample appears to be stained.

2.3.2 Soil Sampling Objectives

The specific objective of soil sampling is to define the horizontal extent of contamination in the areas shown on Figure 2. These data will be used to identify the extent of areas that will need to be capped as a part of the final remedy. The present interpretation of the data indicates that soil capping activities will be needed in Areas 1, 4, and 5.

2.3.3 Soil Sampling Locations and Frequency

The soil sampling locations were selected to fill data gaps based on the spatial distribution of previous sampling events. The proposed soil sampling activities are anticipated to be a one-time sampling event. In the event that soil CoC concentrations are detected in excess of limiting MDEQ Tier 1 TRGs, additional sampling may be necessary to adequately define contaminant boundaries.

2.4 Extent of Contamination in Groundwater

Groundwater contamination at the site has been extensively investigated through the RFI process. Previous sampling events indicated contaminant plumes extending toward Stouts Bayou to the east and Hennessey Bayou to the south. Due to the extended amount of time that has elapsed since the last sampling of all wells, a baseline groundwater sampling event is necessary to confirm present groundwater conditions. It is necessary to conduct the sampling proposed in this Work Plan prior to implementing the final groundwater remedy. Based on the results of the baseline groundwater sampling, additional monitor wells may be necessary to adequately define current groundwater conditions. A map showing the well locations is included as Figure 3.

2.4.1 Groundwater SAP

Prior to collecting the groundwater samples, static water level measurements will be recorded in all temporary wells, and each well will be checked for the presence of any free-phase material.

Groundwater samples will be collected from each well using either a small-diameter hand bailer, high volume pump (i.e., Grundfos Redi-flo® pump), flow through cell, or a peristaltic pump. In accordance with the procedures outlined in Section 11.6 of the QAPP, sampling will be conducted using low-flow procedures or each well will be purged of three to five volumes of standing water (or until dry) prior to collecting a groundwater sample. Each groundwater sample will be poured directly into the appropriate laboratory-provided sample container(s), the containers properly labeled, and placed in an ice bath within an insulated ice chest. Separate aliquots of groundwater will be collected during purging from each well with a goal of stabilization prior to sampling. Stabilization will be determined through the field measurement of pH, specific conductance, temperature, and turbidity. As each well is being purged and sampled, Field Parameters and Water Sampling Logs (Appendix B) will be completed by sampling personnel.

The samples will be submitted to the laboratory under proper chain-of-custody protocols. Selected parameters will be analyzed in accordance with the data presented in Table 3 specific to each analysis. At a minimum, the groundwater samples will be analyzed for the analytical parameters proposed in Table 5, or an analytical parameter set provided by MDEQ.

2.4.2 Groundwater Sampling and Objectives

The specific objective of groundwater sampling is to define the present condition of groundwater in the existing monitor wells and determine if the network sufficiently monitors the existing known groundwater impacts.

2.4.3 Groundwater Sampling Locations and Frequency

The existing groundwater monitor well network consists of 37 wells. No new monitor or recovery wells are proposed to be installed during this sampling event. Well construction data for the monitor wells were obtained from Table 1 of the *Draft Groundwater Assessment Report* (URS 2001b). The locations of the wells are shown on Figure 3. A copy of Table 1 is presented in Appendix C. The exact condition of each well is presently unknown. However, a monitor well inspection will be conducted at each well during the baseline sampling event and a checklist prepared. A copy of the checklist is included in Appendix D. It is assumed that the wells are in good enough condition to provide samples representative of the groundwater zone in which the well was initially completed. The baseline groundwater sampling activities proposed herein are anticipated to be a one-time sampling event. Based on the

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results, a routine sampling frequency and parameter list will be proposed to MDEQ in the Site Characterization Report for future sampling activities. In the event that groundwater CoC concentrations are detected in excess of limiting MDEQ Tier 1 TRGs, additional sampling and or well installation activities may need to be conducted to adequately monitor groundwater concentrations prior to the submission of the Site Characterization Report.

2.5 Storm Water Sampling

2.5.1 Storm Water SAP

Storm water samples will be collected from various locations at the site as shown on Figure 4. Samples will be collected during a storm water event of sufficient intensity and duration to collect a sample representative of sheet flow conditions. Each storm water sample will be a grab sample collected in clean containers supplied by the laboratory. Dippers, bailers, or similar sampling equipment may be used, if necessary, to collect a representative sample. If not, sample containers will be lowered to the surface of the storm water for filling. Once filled, the containers will be properly sealed, labeled, and placed in an ice bath within an insulated ice chest. The ice chest and a completed chain-of-custody document will be shipped or transported to the laboratory.

The samples will be submitted to the laboratory under proper chain-of-custody protocols. Selected parameters will be analyzed in accordance with the data presented in Table 3 specific to each analysis. At a minimum, the storm water samples will be analyzed for the analytical parameters contained in Table 6, or an analytical parameter set provided by MDEQ. The storm water parameters identified in Table 6 were contained in Vicksburg Chemical's previous State of Mississippi Water Pollution Control permit (MS0027995).

2.5.2 Storm Water Sampling Objectives

The specific objectives of storm water sampling are:

- To determine potential areas that may adversely impact site storm water; and
- To determine if any best management practices and/or storm water treatment is necessary prior to discharge to the Mississippi River.

2.5.3 Storm Water Sampling Locations and Frequency

The proposed storm water sampling locations are presented on Figure 3. The majority of the locations shown on this map are sheet flow sample locations. In addition to the sheet flow sample locations, storm water sumps, storm water basins, and the storm water outfall will be sampled. The activities proposed in this document are intended to be a one-time baseline sampling event. The purpose of the baseline sampling is to determine if treatment is necessary and define the sample points and parameter set(s) that should continue to be monitored in future storm water sampling events.

2.6 Investigation Derived Wastes

Waste materials generated during this investigation and corrective action will include soil, used personal protective equipment, decontamination water, and purged groundwater. Waste materials will be appropriately containerized or placed into the storm water basin with approval from MDEQ. All drums will be labeled with the contents of the drum and date of generation of the waste material. The drums will be staged in a secure location and will be incorporated into the remediation to be conducted at the site. Liquid and solid waste will be segregated to facilitate final disposal.

2.7 Regulatory Involvement

All site activities will be conducted after receiving approval of this Work Plan from MDEQ. MDEQ will have oversight on all aspects of remediation activities conducted at this site as per the Agreed Order. Future sampling frequencies, parameter lists, methodology, etc., will be approved by MDEQ prior to field implementation.

All wells advanced by direct push technology methods will be plugged by a State of Mississippi certified water well driller in accordance with MDEQ-approved methods. The plugging and abandonment will be conducted with a cement/bentonite mixture, or a material that provides equivalent subsurface protection.

2.8 Additional Work

A registered land surveyor will survey all soil sample points and monitor well locations. These locations will be plotted on a scaled map of the site.

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3. Remedial Site Conceptual Exposure Model

A draft Remedial Site Conceptual Exposure Model (RSCEM) form for the site is presented in Appendix E. The RSCEM is an important tool for obtaining an understanding of site exposure pathway dynamics. It depicts the site and its environment(s) and delineates potential chemical sources, chemical release and transport mechanisms, affected media, migration routes, and potential human and ecological receptors. The RSCEM provides a framework for problem definition, aids in the identification of data gaps, and, more importantly, identifies key exposure pathways and associated media on which to focus assessment activities.

The RSCEM represents potential exposure pathways under both current and foreseeable future exposure scenarios. An industrial exposure scenario will be considered for the portion of the site that was the former Vicksburg Chemical plant. The apparent release source is the former site operations. The RSCEM identifies soil and groundwater as the media of concern. Potential receptors include current and future industrial workers and site visitors and hypothetical future recreational receptors via groundwater/surface water exchange. The final remediation will address the exposure pathways to protect potential receptors.

4. Reporting

Following the completion of all field activities, a Site Characterization Report will be prepared for submittal to MDEQ. The report will document all field activities and present an interpretation of surface and subsurface conditions. Appropriate historical and new data tables, figures, and appendices will be included in the report to support the text. The report will conclude by presenting recommendations for a path forward to obtain site closure.

5. Schedule

The sampling program will be initiated within 3 weeks of receiving written authorization to proceed from MDEQ. It is anticipated that the planned field activities can be completed within 3 to 4 weeks. Analytical data should be received within 2 weeks of completing the last planned field activities. A Site Characterization Report will be prepared and submitted to MDEQ within 8 weeks of receipt of the analytical results. If field activities are delayed, or if additional field activities are required to completely define the nature and extent of subsurface impacts, MDEQ will be promptly notified.

F I N A L

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URS. 2001a. RCRA Facility Investigation Draft Final Report, Vicksburg Chemical Company. August.

URS. 2001b. Draft Groundwater Assessment Report, Vicksburg Chemical Company. November.

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Table 1. Exceedances of MDEQ Tier 1 TRG for Restricted Soil Use, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Sample Depth (ft)	Chemical of Concern	Site Concentration[1]	MDEQ Tier 1 TRG (Restricted)	Units	Concentration Exceeds Tier 1 TRG (Restricted)
Soil Samples							
1, 16, 17	D-1-B	0-1	Arsenic	12,500	11,800	µg/kg	Yes
1, 16, 17	I-1-B	0-1	Toxaphene	31,700	5,200	µg/kg	Yes
1, 16, 17	I-1-B	0-1	Arsenic	27,000	11,800	µg/kg	Yes
1, 16, 17	L-1-A	0-1	Arsenic	14,500	11,800	µg/kg	Yes
1, 16, 17	2-C-C	Concrete	Arsenic	36,000	11,800	µg/kg	Yes
1, 16, 17	11-C-C	Concrete	Atrazine	52,800	25,800	µg/kg	Yes
1, 16, 17	12-2-A	1-2	Arsenic	13,300	11,800	µg/kg	Yes
1, 16, 17	15-2-A	1-2	Arsenic	12,900	11,800	µg/kg	Yes
1, 16, 17	16-C-A	Concrete	Arsenic	13,700	11,800	µg/kg	Yes
1, 16, 17	18-C-A	Concrete	Arsenic	27,000	11,800	µg/kg	Yes
1, 16, 17	19-C-A	Concrete	Arsenic	18,800	11,800	µg/kg	Yes
4	4-4	0.5-1	Arsenic	15,700	11,800	µg/kg	Yes
5	5-4	3-10	Arsenic	39,200	11,800	µg/kg	Yes
5	5-11	3-10	Arsenic	30,800	11,800	µg/kg	Yes
5	5-13	3-10	Arsenic	174,000	11,800	µg/kg	Yes
5	5-14	3-10	Arsenic	39,000	11,800	µg/kg	Yes
9	8S	0.5-1	Arsenic	61,000	11,800	µg/kg	Yes
9	8D	1.5-2	Arsenic	60,000	11,800	µg/kg	Yes
9	A-1 Result		Benzo(a)pyrene	1,160	784	µg/kg	Yes
11, 12, 15	B-1-D (Sump/Drainage)	0-1	Arsenic	39,400	11,800	µg/kg	Yes
11, 12, 15	E-1-D (Sump/Drainage)	0-1	Arsenic	345,000	11,800	µg/kg	Yes
11, 12, 15	BB-1-D (Sump/Drainage)	0-1	Arsenic	2,870,000	11,800	µg/kg	Yes
11, 12, 15	Q-1-D (Sump/Drainage)	0-1	Arsenic	2,080,000	11,800	µg/kg	Yes
11, 12, 15	EE-1-D (Sump/Drainage)	0-1	Arsenic	456,000	11,800	µg/kg	Yes
11, 12, 15	EE-1-D (Sump/Drainage)	0-1	PCDD/PCDF (Dioxin)	0.344	0.0763	µg/kg	Yes
11, 12, 15	V-1-D (Sump/Drainage)	0-1	Arsenic	2,770,000	11,800	µg/kg	Yes
11, 12, 15	W-1-D (Sump/Drainage)	0-1	Arsenic	145,000	11,800	µg/kg	Yes
11, 12, 15	Y-1-D (Sump/Drainage)	0-1	Arsenic	60,200	11,800	µg/kg	Yes
11, 12, 15	M-1-D (Sump/Drainage)	0-1	Arsenic	35,600	11,800	µg/kg	Yes
11, 12, 15	1-C-D	Concrete	Arsenic	18,400	11,800	µg/kg	Yes
11, 12, 15	5-C-D	Concrete	Arsenic	70,600	11,800	µg/kg	Yes
11, 12, 15	6-1-D	0-1	Arsenic	24,900	11,800	µg/kg	Yes
11, 12, 15	6-2-D	1-2	Arsenic	14,100	11,800	µg/kg	Yes
11, 12, 15	C-1-G	0-1	Arsenic	216,000	11,800	µg/kg	Yes
11, 12, 15	C-2-G	1-2	Arsenic	501,000	11,800	µg/kg	Yes
11, 12, 15	C-3-G	2-4	Arsenic	76,000	11,800	µg/kg	Yes

Table 1. Exceedances of MDEQ Tier 1 TRG for Restricted Soil Use, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Sample Depth (ft)	Chemical of Concern	Site Concentration[1,2]	MDEQ Tier 1 TRG (Restricted)	Units	Concentration Exceeds Tier 1 TRG (Restricted)
Soil Samples (continued)							
11, 12, 15	C-4-G	4-6	Arsenic	109,000	11,800	µg/kg	Yes
11, 12, 15	C-5-G	6-8	Arsenic	114,000	11,800	µg/kg	Yes
11, 12, 15	D-1-G	0-1	Arsenic	48,800	11,800	µg/kg	Yes
11, 12, 15	D-2-G	1-2	Arsenic	309,000	11,800	µg/kg	Yes
11, 12, 15	D-4-G	4-6	Arsenic	27,600	11,800	µg/kg	Yes
11, 12, 15	D-5-G	6-8	Arsenic	14,700	11,800	µg/kg	Yes
11, 12, 15	H-1-G	0-1	Arsenic	22,300	11,800	µg/kg	Yes
11, 12, 15	I-1-G	0-1	Arsenic	72,800	11,800	µg/kg	Yes
11, 12, 15	I-2-G	1-2	Arsenic	57,500	11,800	µg/kg	Yes
11, 12, 15	I-3-G	2-4	Arsenic	185,000	11,800	µg/kg	Yes
11, 12, 15	I-4-G	4-6	Arsenic	241,000	11,800	µg/kg	Yes
11, 12, 15	I-5-G	6-8	Arsenic	138,000	11,800	µg/kg	Yes
11, 12, 15	J-1-G	0-1	Arsenic	101,000	11,800	µg/kg	Yes
11, 12, 15	J-2-G	1-2	Arsenic	205,000	11,800	µg/kg	Yes
11, 12, 15	K-1-G	0-1	Arsenic	38,800	11,800	µg/kg	Yes
11, 12, 15	K-2-G	1-2	Arsenic	31,500	11,800	µg/kg	Yes
11, 12, 15	K-3-G	2-4	Arsenic	14,600	11,800	µg/kg	Yes
11, 12, 15	K-4-G	4-6	Arsenic	46,000	11,800	µg/kg	Yes
11, 12, 15	K-6-G	8-10	Arsenic	55,100	11,800	µg/kg	Yes
11, 12, 15	L-1-G	0-1	Arsenic	132,000	11,800	µg/kg	Yes
11, 12, 15	L-2-G	1-2	Arsenic	80,600	11,800	µg/kg	Yes
11, 12, 15	O-1-G	0-1	Arsenic	254,000	11,800	µg/kg	Yes
11, 12, 15	O-2-G	1-2	Arsenic	41,400	11,800	µg/kg	Yes
11, 12, 15	T-2-G	1-2	Arsenic	14,400	11,800	µg/kg	Yes
11, 12, 15	X-1-G	0-1	Arsenic	64,400	11,800	µg/kg	Yes
11, 12, 15	X-2-G	1-2	Arsenic	63,300	11,800	µg/kg	Yes
11, 12, 15	Z-1-G	0-1	Arsenic	323,000	11,800	µg/kg	Yes
11, 12, 15	Z-2-G	1-2	Arsenic	51,200	11,800	µg/kg	Yes
11, 12, 15	Z-3-G	2-4	Arsenic	22,300	11,800	µg/kg	Yes
11, 12, 15	DD-1-G	0-1	Arsenic	24,300	11,800	µg/kg	Yes
11, 12, 15	DD-2-G	1-2	Arsenic	59,600	11,800	µg/kg	Yes
11, 12, 15	ZZ-1-G	0-1	Arsenic	11,900	11,800	µg/kg	Yes
11, 12, 15	ZZ-2-G	1-2	Arsenic	18,100	11,800	µg/kg	Yes
11, 12, 15	7-C-G	Concrete	Arsenic	68,200	11,800	µg/kg	Yes
18	18-1	0.5-1	Arsenic	17,500	11,800	µg/kg	Yes
18	18-3	0.5-1	Arsenic	12,800	11,800	µg/kg	Yes
20	20-21C		Chloroform	2,186	478	µg/kg	Yes
23	22-B		Chloroform	830	478	µg/kg	Yes
30	30-1	0.5-1	TPH (conservative)	4,433,000	300,000	µg/kg	Yes
30	30-2	0.5-1	TPH (conservative)	699,000	300,000	µg/kg	Yes
30	30-3	0.5-1	TPH (conservative)	15,431,000	300,000	µg/kg	Yes

Table 1. Exceedances of MDEQ Tier 1 TRG for Restricted Soil Use, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Sample Depth (ft)	Chemical of Concern	Site Concentration[1]	MDEQ Tier 1 TRG (Restricted)	Units	Concentration Exceeds Tier 1 TRG (Restricted)
Composite Surface Samples (2 to 8 grab samples from each quartile of each section composited)							
20	20-A	0-0.5	Toxaphene	8,240	5,200	µg/kg	Yes
20	20-B	0-0.5	Toxaphene	18,989	5,200	µg/kg	Yes
20	20-C	0-0.5	Dinoseb	355,541	204,000	µg/kg	Yes
20	20-C	0-0.5	Toxaphene	8,401	5,200	µg/kg	Yes
20	20-D	0-0.5	Toxaphene	14,200	5,200	µg/kg	Yes
20	20-F	0-0.5	Dinoseb	1,078,068	204,000	µg/kg	Yes
20	20-F	0-0.5	Toxaphene	10,318	5,200	µg/kg	Yes
20	20-G	0-0.5	Toxaphene	22,981	5,200	µg/kg	Yes
20	20-H	0-0.5	Toxaphene	19,052	5,200	µg/kg	Yes
20	20-I	0-0.5	Toxaphene	110,964	5,200	µg/kg	Yes
20	20-J	0-0.5	Toxaphene	41,652	5,200	µg/kg	Yes
20	20-K	0-0.5	Toxaphene	6,098	5,200	µg/kg	Yes
20	20-N	0-0.5	Toxaphene	9,263	5,200	µg/kg	Yes
20	20-O	0-0.5	Toxaphene	6,727	5,200	µg/kg	Yes
20	20-T	0-0.5	Arsenic	12,100	11,800	µg/kg	Yes
20	20-T	0-0.5	Toxaphene	7,617	5,200	µg/kg	Yes
Composite Soil Pile Samples (8 grab samples composited)							
20	20-BB	0-0.5	Toxaphene	37,036	5,200	µg/kg	Yes
20	20-CC	0-0.5	Toxaphene	6,852	5,200	µg/kg	Yes
20	20-DD	0-0.5	Toxaphene	14,691	5,200	µg/kg	Yes
20	20-EE	0-0.5	Toxaphene	16,815	5,200	µg/kg	Yes
20	20-FF	0-0.5	Toxaphene	76,683	5,200	µg/kg	Yes
20	20-II	0-0.5	Toxaphene	17,413	5,200	µg/kg	Yes
20	20-LL	0-0.5	Toxaphene	14,673	5,200	µg/kg	Yes
20	20-MM	0-0.5	Toxaphene	11,152	5,200	µg/kg	Yes

(1) Analytical data obtained from RFI process.
MDEQ Mississippi Department of Environmental Quality.
SWMU Solid Waste Management Unit.
Tier 1 TRG (Restricted) MDEQ Tier 1 TRG for the restricted use of soil.
TPH Total Petroleum Hydrocarbon.
TRG Target Remediation Goal.
µg/kg Micrograms per Kilogram.

Table 2. Exceedances of MDEQ Tier 1 TRG for Groundwater, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Chemical of Concern	Site Concentration[1]	MDEQ Tier 1 TRG	Units	Concentration Exceeds Tier 1 TRG
1, 16, 17	2-W-TA	Arsenic	538	50	µg/L	Yes
2	MW-5	Dinoseb	12	7	µg/L	Yes
2	MW-5	Trichloroethene	79	5	µg/L	Yes
2	MW-6	Dinoseb	75	7	µg/L	Yes
2	MW-6	Toxaphene	25	3	µg/L	Yes
2	MW-6	Trichloroethene	9.03	5	µg/L	Yes
2	LS1-W	Bis(2-ethyl)hexylphthalate	213.44	6	µg/L	Yes
2	LS2-W	4-Nitrophenol	547.61	292	µg/L	Yes
2	LS2-W	Atrazine	478	3	µg/L	Yes
2	LS2-W	Carbon Tetrachloride	71.4	5	µg/L	Yes
2	LS2-W	Dinoseb	8,714	7	µg/L	Yes
2	LS3-W	Bis(2-ethyl)hexylphthalate	474.04	6	µg/L	Yes
2	LS4-W	Chloroform	17.3	0.155	µg/L	Yes
2	LS4-W	Carbon Tetrachloride	126	5	µg/L	Yes
2	LS4-W	Bis(2-ethyl)hexylphthalate	42.03	6	µg/L	Yes
2	LS4-W	Dinoseb	597	7	µg/L	Yes
2	LS5-W	Chloroform	105	0.155	µg/L	Yes
2	LS5-W	Acetophenone	18.92	0.0416	µg/L	Yes
2	LS5-W	4-Nitrophenol	2,359	292	µg/L	Yes
2	LS5-W	Bis(2-ethyl)hexylphthalate	130.9	6	µg/L	Yes
2	LS5-W	Atrazine	6.33	3	µg/L	Yes
2	LS5-W	Dinoseb	797	7	µg/L	Yes
2	2-15-W	Atrazine	123	3	µg/L	Yes
9	TP-1	Arsenic	378	50	µg/L	Yes
9	TP-1	Trichloroethene	68	5	µg/L	Yes
9	MW-18A	Arsenic	319	50	µg/L	Yes
9	MW-18B	Arsenic	197	50	µg/L	Yes
9	MW-18B	Dinoseb	132	7	µg/L	Yes
11, 12, 15	G-W-G	Arsenic	14,300	50	µg/L	Yes
11, 12, 15	D-W-G	Arsenic	253	50	µg/L	Yes
11, 12, 15	I-W-G	Arsenic	288,000	50	µg/L	Yes
11, 12, 15	K-W-G	Arsenic	297	50	µg/L	Yes
11, 12, 15	R-W-G	Arsenic	5,260	50	µg/L	Yes
11, 12, 15	X-W-G	Arsenic	730	50	µg/L	Yes
11, 12, 15	Z-W-G	Arsenic	1,720	50	µg/L	Yes
11, 12, 15	DD-W-G	Arsenic	1,260	50	µg/L	Yes
11, 12, 15	WW-W-G	Arsenic	56	50	µg/L	Yes
11, 12, 15	ZZ-W-G	Arsenic	216	50	µg/L	Yes
11, 12, 15	7-W-G	Arsenic	51,000	50	µg/L	Yes
11, 12, 15	MW-17A	Carbon Tetrachloride	7.25	5	µg/L	Yes
11, 12, 15	MW-17B	Chloroform	1.43	0.155	µg/L	Yes
11, 12, 15	MW-18A	Arsenic	319	50	µg/L	Yes
11, 12, 15	MW-18B	Arsenic	194	50	µg/L	Yes
11, 12, 15	MW-18B	Dinoseb	132	7	µg/L	Yes
20	MW-1C	Chloroform	1.38	0.155	µg/L	Yes
20	MW-1C	Trichloroethene	10.8	5	µg/L	Yes
20	MW-10C	Dinoseb	717	7	µg/L	Yes

Table 2. Exceedances of MDEQ Tier 1 TRG for Groundwater, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Chemical of Concern	Site Concentration[1)]	MDEQ Tier 1 TRG	Units	Concentration Exceeds Tier 1 TRG
20	MW-10C	Chloroform	1,076	0.155	µg/L	Yes
20	MW-10C	Carbon Tetrachloride	1,486	5	µg/L	Yes
20	MW-12C	Dinoseb	277	7	µg/L	Yes
20	MW-12C	Vinyl Chloride	13	2	µg/L	Yes
20	MW-12C	1,1-Dichloroethene	7.39	7	µg/L	Yes
20	MW-12C	1,2-Dichloroethene (total)	88.3	70	µg/L	Yes
20	MW-12C	Chloroform	3,879	0.155	µg/L	Yes
20	MW-12C	1,2-Dichloroethane	113	5	µg/L	Yes
20	MW-12C	Carbon Tetrachloride	23,350	5	µg/L	Yes
20	MW-12C	1,1,2-Trichloroethane	84.2	5	µg/L	Yes
20	MW-12C	Tetrachloroethene	174	5	µg/L	Yes
20	20-18-W	Atrazine	65	3	µg/L	Yes
20	20-18-W	Chloroform	21.5	0.155	µg/L	Yes
20	20-18-W	Carbon Tetrachloride	13.3	5	µg/L	Yes
20	20-18-W	Benzene	9.58	5	µg/L	Yes
20	20-19-W	Benzene	7.21	5	µg/L	Yes
20	20-20-W	Dinoseb	18,821	7	µg/L	Yes
20	20-20-W	Chloromethane	3.36	1.43	µg/L	Yes
20	20-20-W	Chloroform	10.2	0.155	µg/L	Yes
20	20-20-W	Carbon Tetrachloride	46.2	5	µg/L	Yes
20	20-21-W	Atrazine	140	3	µg/L	Yes
20	20-21-W	Chloromethane	126	1.43	µg/L	Yes
20	20-21-W	Vinyl Chloride	5.46	2	µg/L	Yes
20	20-21-W	Methylene Chloride	908	5	µg/L	Yes
20	20-21-W	1,1-Dichloroethene	54.6	7	µg/L	Yes
20	20-21-W	1,2-Dichloroethene (total)	1,758	70	µg/L	Yes
20	20-21-W	Chloroform	37,380	0.155	µg/L	Yes
20	20-21-W	1,2-Dichloroethane	321	5	µg/L	Yes
20	20-21-W	Carbon Tetrachloride	357,500	5	µg/L	Yes
20	20-21-W	Bromodichloromethane	296	0.168	µg/L	Yes
20	20-21-W	cis-1,3-Dichloropropene	42.3	0.0842	µg/L	Yes
20	20-21-W	Trichloroethene	1,346	5	µg/L	Yes
20	20-21-W	Benzene	23.7	5	µg/L	Yes
20	20-21-W	1,1,2-Trichloroethane	290	5	µg/L	Yes
20	20-21-W	Tetrachloroethene	180	5	µg/L	Yes
20	20-22-W	Atrazine	146	3	µg/L	Yes
20	20-22-W	Dinoseb	396	7	µg/L	Yes
20	20-22-W	Vinyl Chloride	46.5	2	µg/L	Yes
20	20-22-W	Methylene Chloride	45.7	5	µg/L	Yes
20	20-22-W	1,2-Dichloroethene (total)	125	70	µg/L	Yes
20	20-22-W	Chloroform	5,120	0.155	µg/L	Yes
20	20-22-W	1,2-Dichloroethane	68.2	5	µg/L	Yes
20	20-22-W	Carbon Tetrachloride	4,705	5	µg/L	Yes
20	20-22-W	Bromodichloromethane	75.8	0.168	µg/L	Yes
20	20-22-W	1,2-Dichloropropane	11.2	5	µg/L	Yes
20	20-22-W	Trichloroethene	44.6	5	µg/L	Yes
20	20-22-W	Benzene	9.33	5	µg/L	Yes

Table 2. Exceedances of MDEQ Tier 1 TRG for Groundwater, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Chemical of Concern	Site Concentration(1)	MDEQ Tier 1 TRG	Units	Concentration Exceeds Tier 1 TRG
20	20-22-W	1,1,2-Trichloroethane	74.4	5	µg/L	Yes
20	20-22-W	Tetrachloroethene	55.2	5	µg/L	Yes
20	20-23-W	Atrazine	30	3	µg/L	Yes
20	20-23-W	Dinoseb	27	7	µg/L	Yes
23	20-B	Chloroform	1,700	0.155	µg/L	Yes
23	20-B	Bromodichloromethane	36	0.168	µg/L	Yes
23	20-B	Dibromochloromethane	14	0.126	µg/L	Yes
23	22-A	Chloroform	44	0.155	µg/L	Yes
23	22-B	Chloroform	1,600	0.155	µg/L	Yes
23	22-B	Bromodichloromethane	66	0.168	µg/L	Yes
23	22-B	Dibromochloromethane	78	0.126	µg/L	Yes
23	22-B	Bromoform	160	8.48	µg/L	Yes
23	23-B	Chloroform	79	0.155	µg/L	Yes
23	22-1-W	Chloroform	6.78	0.155	µg/L	Yes

(1) Analytical data obtained from RFI process.
MDEQ Mississippi Department of Environmental Quality.
SWMU Solid Waste Management Unit.
Tier 1 TRG MDEQ Tier 1 TRG for Groundwater.
TRG Target Remediation Goal.
µg/L Micrograms per Liter.

ARCADIS

Table 3. Summary of Methods, Containers, Preservatives, and Holding Times, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Matrix	Preparation Method	Analytical Method [a]	Container [b]	Preservative	Holding Time [c]
General Parameters						
VOCs	Water	5030, 5032	8260/624	3 x 40-mL vial with Teflon lined septum	pH < 2 with HCl, Cool 4°C	14 days
	Water	5030, 5032	8260/624	3 x 40-mL vial with Teflon lined septum	If effervescence is observed, eliminate HCl preservative and Cool 4°C	7 days
	Solid	5035	8260	3 x Encore™ OR 2 x Sodium Bisulfate vial	Cool 4°C	48 hours to preservation for Encore™, then 14 days to
SVOCs	Water	3510, 3520 [d]	8270 (Low Level)/625	2 x 1-L amber G	Cool 4°C [e]	7 days to extraction and 40 days to analysis
	Solid	3540, 3550 [d]	8270 (Low Level)	1 x 4-oz or 8-oz G	Cool 4°C	14 days to extraction and 40 days to analysis
Organochlorine Pesticides	Water	3510, 3520 [d]	8081/608	2 x 1-L amber G	Cool 4°C [e]	7 days to extraction and 40 days to analysis
	Solid	3540, 3550 [d]	8081	1 x 4-oz or 8-oz G	Cool 4°C	14 days to extraction and 40 days to analysis
Organochlorine Herbicides	Water	3510, 3520 [d]	8151	2 x 1-L amber G	Cool 4°C [e]	7 days to extraction and 40 days to analysis
	Solid	3540, 3550 [d]	8151	1 x 4-oz or 8-oz G	Cool 4°C	14 days to extraction and 40 days to analysis
Metals (except Mercury)	Water	3005, 3010	6010/6020/200.7	1 x 1-L HDPE	pH < 2 with HNO_3, Cool 4°C	6 months
	Solid	3050, 3051	6010	1 x 8-oz G	Cool 4°C	6 months
Waste Characterization Parameters						
Corrosivity (pH)	Aqueous Waste	NA	9040	250 mL HDPE	NA	24 hours
	Solid Waste Material	NA	9045	1 x 8-oz wide-mouth G	NA	24 hours
General Chemistry Parameters						
Ammonia	Water	NA	350.3	250 mL HDPE	pH < 2 with H_2SO_4, Cool 4°C	28 days
BOD	Water	NA	405.1	1 x 1-L HDPE	Cool 4°C	48 hours
Chloride	Water	NA	325.3/300.0/9056	250 mL HDPE/2 x 40 mL vial	Cool 4°C	28 days
COD	Water	NA	HACH 8000	125 mL HDPE	pH <2 with H_2SO_4	28 days
Fluoride	Water	NA	340.1/340.2	500 mL HDPE	Cool 4°C	28 days

Table 3. Summary of Methods, Containers, Preservatives, and Holding Times, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Matrix	Preparation Method	Analytical Method [a]	Container [b]	Preservative	Holding Time [c]
Nitrate	Water	NA	353.2/300.0/9056	250 mL HDPE/ 2 x 40 mL vial	Cool 4°C	2 days
Phosphorus (Total)	Water	NA	365.1/365.2/365.5	1 x 100 mL HDPE or G	pH < 2 with H_2SO_4	28 days
Sulfate	Water	NA	375.4/300.0/9056	250 mL HDPE/	Cool 4°C	28 days
Total Dissolved Solids (TDS)	Water	NA	160.1	500 mL HDPE	Cool 4°C	7 days
Total Suspended Solids TSS)	Water	NA	160.2	500 mL HDPE	Cool 4°C	7 days

(b) Sample volumes may be combined for MNA parameters where preservatives are the same and adequate sample volume is supplied to the laboratory. Volumes
(c) Maximum holding time allowed from date of collection.
(d) Cleanup methods may be applicable if matrix interference is encountered. Cleanup methods may include alumina (Method 3610), florisil (Method 3620), silica gel
(e) If residual chlorine is present, requires sodium thiosulfate in each sample container.
(f) Waste Characterization addresses solid (soils, sludge, waste) material analysis for waste disposal purposes. Liquid (aqueous or organic) wastes will be
(g) This holding time is a contractual holding time that has been established by ARCADIS and is established in the USEPA Region 4 Laboratory Operations and

°C	Degrees Centigrade.	mL	Milliliter.
BOD	Biological Oxygen Demand.	MNA	Monitored Natural Attenuation.
COD	Chemical Oxygen Demand.	NA	Not Applicable.
G	Glass.	oz	Ounce.
GPC	Gel Permeation Chromatography.	RCRA	Resource Conservation and Recovery Act.
H_2SO_4	Sulfuric Acid.	SVOCs	Semivolatile Organic Compounds.
HCl	Hydrochloric Acid.	TSS	Total Suspended Solids.
HDPE	High Density Polyethylene.	USEPA	U.S. Environmental Protection Agency.
HNO_3	Nitric Acid.	VOCs	Volatile Organic Compounds.
L	Liter.		

Table 4. Proposed Soil Sampling Parameters, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Analytical Method	Chemical of Concern	MDEQ Tier 1 TRG (Restricted Use) (mg/kg)
Volatile Organic Compounds (VOCs)	Method 8260	Benzene	1.36
		Bromodichloromethane	1.89
		Bromoform	90.1
		Carbon Tetrachloride	0.569
		Chloroform	0.478
		Dibromochloromethane	68.1
		1,2-Dichloroethane	0.621
		Methylene Chloride	21.9
		1,1,1,2-Tetrachloroethane	220
		Tetrachloroethene	18.2
		Trichloroethene	7.92
		1,2,4-Trimethylbenzene	102,000
		1,3,5-Trimethylbenzene	436
		Vinyl Chloride	0.939
Semivolatile Organic Compounds (SVOCs)	Method 8270	Acetophenone	2,630
		Atrazine	25.8
		bis-(2-Ethyl)hexyl Phthalate	409
		Cyanazine	6.81
		4-Nitrophenol	16,400
		Pentachlorophenol	23.8
Organochlorine Pesticides	Method 8081	Toxaphene	5.2
Organochlorine Herbicides	Method 8151	Dinoseb	204
Metals	Method 6010 or 6020	Arsenic	11.8

MDEQ Mississippi Department of Environmental Quality.
mg/kg Milligrams per kilogram.
TRG Target Remediation Goal.

Table 5. Proposed Groundwater Sampling Parameters, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Analytical Method	Chemical of Concern	MDEQ Tier 1 TRG (µg/L)
Volatile Organic Compounds (VOCs)	Method 8260	Benzene	5 (MCL)
		Bromodichloromethane	0.168
		Bromoform	8.48
		Carbon Tetrachloride	5 (MCL)
		Chloroform	0.155
		Dibromochloromethane	0.126
		1,2-Dichloroethane	5 (MCL)
		Methylene Chloride	5 (MCL)
		1,1,1,2-Tetrachloroethane	0.406
		Tetrachloroethene	5 (MCL)
		Trichloroethene	5 (MCL)
		1,2,4-Trimethylbenzene	12.3
		1,3,5-Trimethylbenzene	12.3
		Vinyl Chloride	2 (MCL)
Semivolatile Organic Compounds (SVOCs)	Method 8270	Acetophenone	0.0416
		Atrazine	3 (MCL)
		bis-(2-Ethyl)hexyl Phthalate	6 (MCL)
		Cyanazine	0.0797
		4-Nitrophenol	292
		Pentachlorophenol	1 (MCL)
Organochlorine Pesticides	Method 8081	Toxaphene	3 (MCL)
Organochlorine Herbicides	Method 8151	Dinoseb	7 (MCL)
Metals	Method 6010 or 6020	Arsenic	50 (MCL)

MCL Maximum contaminant level.
MDEQ Mississippi Department of Environmental Quality.
µg/L Micrograms per liter.
TRG Target Remediation Goal.

Table 6. Proposed Storm Water Sampling Parameters, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Analytical Method	Chemical of Concern	Water Quality Limit (µg/L)
Analytical Parameters			
Volatile Organic Compounds (VOCs)	624	Benzene	PQL[1]
		Bromodichloromethane	PQL
		Bromoform	PQL
		Carbon Tetrachloride	PQL
		Chloroform	PQL
		Dibromochloromethane	PQL
		1,2-Dichloroethane	PQL
		Methylene Chloride	PQL
		1,1,1,2-Tetrachloroethane	PQL
		Tetrachloroethene	PQL
		Trichloroethene	PQL
		1,2,4-Trimethylbenzene	PQL
		1,3,5-Trimethylbenzene	PQL
		Vinyl Chloride	PQL
Semivolatile Organic Compounds (SVOCs)	625	Acetophenone	PQL
		Atrazine	PQL
		bis-(2-Ethyl)hexyl Phthalate	PQL
		Cyanazine	PQL
		4-Nitrophenol	PQL
		Pentachlorophenol	PQL
Organochlorine	608	Toxaphene	PQL
Organochlorine	8151	Dinoseb	PQL
Metals	200.7	Arsenic	PQL
Storm Water Parameters			
General Chemistry	350.3	Ammonia (as N)	PQL
	405.1	Biochemical Oxygen Demand (5-day)	PQL
	HACH 8000	Chemical Oxygen Demand	PQL
	325.3/300.0/9056	Chloride	75,000
	340.1/340.2	Fluoride (as F)	PQL
	353.2/300.0/9056	Nitrates (as N)	PQL
	9040	pH	PQL
	375.4/300.0/9056	Sulfate	120,000
	160.1	Total Dissolved Solids	400,000
	365.1/365.2/365.5	Total Phosphorus (as P)	PQL
	160.2	Total Suspended Solids	PQL
Organochlorine	608	Toxaphene	PQL
Organochlorine	8151	Dinoseb	PQL

(1) PQL to be used until final water quality regulatory limits for all chemicals of concern are presented in the forthcoming Agreed Order for Storm Water.

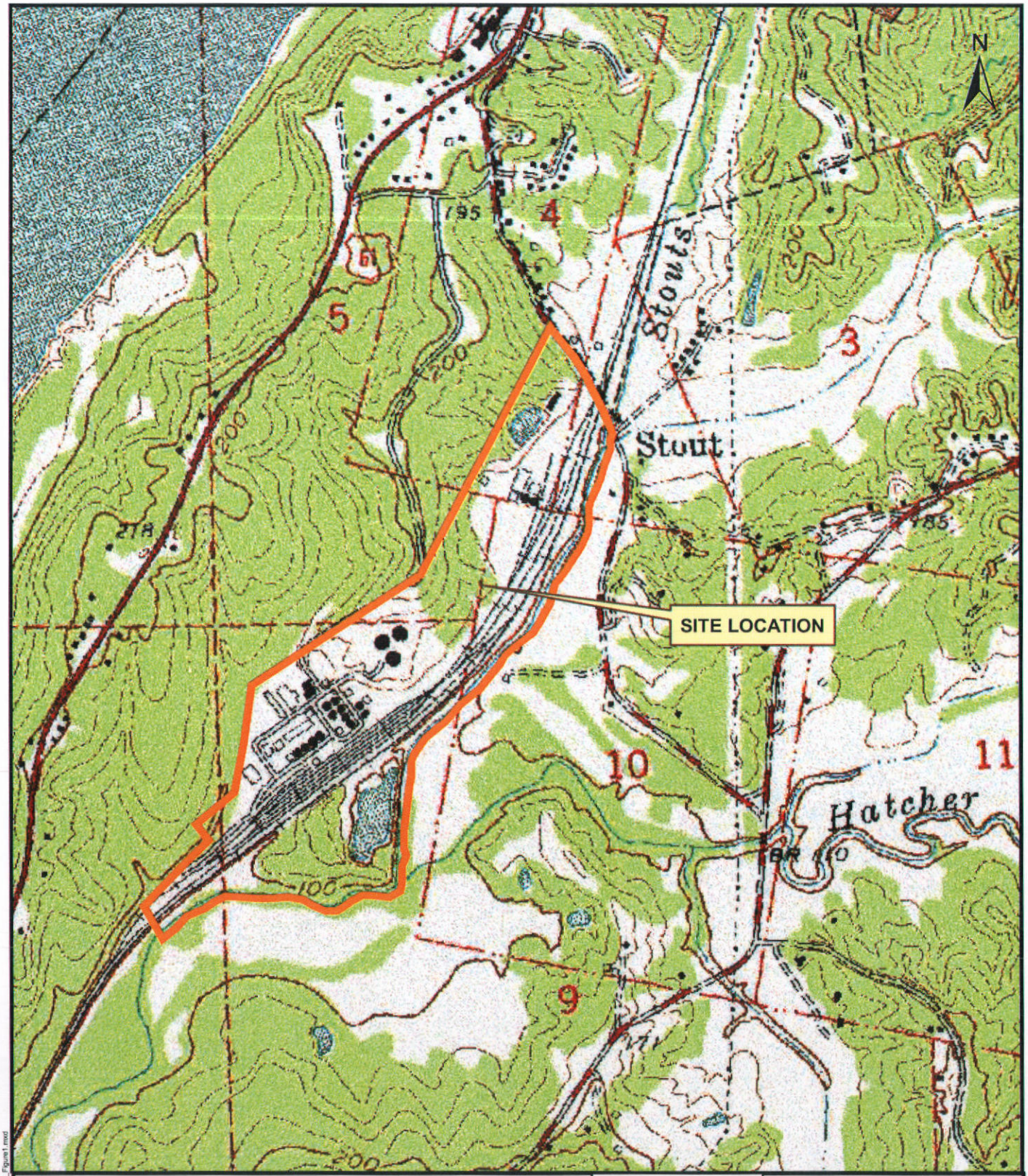
MCL Maximum contaminant level.

MDEQ Mississippi Department of Environmental Quality.

PQL Practical Quantitation Limit.

TRG Target Remediation Goal.

µg/L Micrograms per liter.



Former Plant Site

Note: Approximate Property Boundary

ARCADIS
10352 Plaza Americana Drive
Baton Rouge, Louisiana 70816
Tel: 225.292.1004 Fax: 225.218.9677

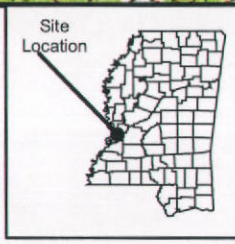
SITE LOCATION MAP

VICKSBURG CHEMICAL COMPANY

VICKSBURG, MISSISSIPPI

REFERENCE:

USGS, Vicksburg West Quadrangle, Mississippi
7.5 Minute Series (Topographic)



500 0 500 1,000 Feet

Project Manager: JE	Completed By: AB
Task Manager: CD	Date: 07/31/2006
Project No.: LA002656.0001	Figure No.: 1

U:\projects\Vicksburg\LA002656.0001.00002\mxd\Vicksburg_SiteMap_Figure1.mxd

U:\projects\Vicksburg\LA002656.0001.00002\plotfiles\Vicksburg_SiteMap.pdf

LEGEND

- PROPOSED SOIL SAMPLING LOCATIONS
- ARSENIC AND TOXAPHENE CONTAMINATION FOUND WITHIN INVESTIGATED BOUNDARIES
- SOIL/SLUDGE CONTAINING VOCs
- ARSENIC CONTAMINATION FOUND WITHIN INVESTIGATED BOUNDARIES
- CONCENTRATION OF CONTAMINATION EXCEEDS VALUES IN MDEQ TIER I TRG TABLE
- TOXAPHENE CONTAMINATION FOUND WITHIN INVESTIGATED BOUNDARIES
- DINOSEB AND TOXAPHENE CONTAMINATION FOUND WITHIN INVESTIGATED BOUNDARIES

AREA 1 – SWMU 1, 5, 7, 8, 9, 11, 12, 14, 15, 16, AND 17
AREA 2 – SWMU 20 (SW CORNER)
AREA 3 – SWMU 2
AREA 4 – SWMU 20 (AREA BOUNDED BY MW-13, MW-14, AND MW-1)
PROPOSED SOIL SAMPLE LOCATION
AREA 5 – SWMU 23

0 200' 400' 800'

DRAWN BY: S. MEN	CHECKED: CAD
PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
DATE: 11-6-06	TASK/PHASE NUMBER: 0007

User Name = dekloria

Path\Name = G:\APROJECT\Mississippi Rivers\LA002656.0001\Figures\2456-01-02a-ProposSoilSampLocation.dwg

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BATON ROUGE, LA 70816
TEL: 225-292-1004
FAX: 225-218-9677
WWW.ARCADIS-US.COM

PROPOSED SOIL SAMPLING LOCATIONS

FORMER VICKSBURG CHEMICAL COMPANY SITE

PROJECT NUMBER	LA002656.0001
DRAWING NUMBER	2

User Name : dek Path\Name : G:\APROJECT\Mississippi Bluffs\LA002656.0001\Figures\MW LOCATIONS.dwg

LEGEND

MW16 MONITORING WELL LOCATION

0 200' 400' 800'

DRAWN BY: D. EKINIA	CHECKED: CAD
PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
DATE: 12-14-06	TASK/PHASE NUMBER: 0007

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MONITOR WELL LOCATIONS

FORMER VICKSBURG CHEMICAL COMPANY SITE

PROJECT NUMBER: LA002656.0001

DRAWING NUMBER: 3

User Name : dek

Path\Name : G:\APROJECT\Mississippi Bluffs\LA002656.0001\Figures\StormwaterSamplingLocations.dwg

LEGEND

10-FOOT CONTOUR INTERVAL

2-FOOT CONTOUR INTERVAL

PROPOSED STORM WATER SAMPLING LOCATION

0 200' 400' 800'

DRAWN BY: S. MEN	CHECKED: CAD
PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
DATE: 10-26-06	TASK/PHASE NUMBER: 0007

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PROPOSED STORM WATER SAMPLING LOCATIONS

FORMER VICKSBURG CHEMICAL COMPANY SITE

PROJECT NUMBER: LA002656.0001

DRAWING NUMBER: 4

Appendix A

Sample Core Log

ARCADIS G & M, Inc.
10352 Plaza Americana Drive
Baton Rouge, LA 70816

SAMPLE / CORE LOG

ring/Well: _____ **Project No.:** _____

Site Location: _____ **Drilling Started:** _____ **Drilling Completed:** _____

Land-Surface Elev.: _____ **Surveyed:** ____ **Estimated:** ____ **Datum:** _____

Drilling Fluid: _____ **Drilling Method Used:** _____

Drilling Contractor: _____ **Driller:** _____ **Helper:** _____

Prepared By: _____ **Hammer Weight:** _____ **Hammer Drop (inches):** _____

Fill | Silty Clay | Silt | Sandy Silt | Silty Sand | Acetate Sleeve | Water First Encountered

Clay | Sandy Clay | Clayey Silt | Sand | Clayey Sand | Split Spoon | Water Level After 10 Minutes

SAMPLE DEPTH (ft)	SAMPLE TYPE	RECOVERY (ft)	SYMBOL	VISUAL DESCRIPTION	USCS (LL/PL/PI)	PP H	PP V	OVA (wo/F) (ppm)	OVA (w/F) (ppm)	REMARKS
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										

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Appendix B

Field Parameters and Water Sampling Logs

FIELD PARAMETERS

ARCADIS U.S., Inc.

Well Identification Number: _____

Project Name/Number: **Mississippi Bluffs/** _____ Date: _____

Water Level (TOC): _____ Total Depth: _____

OVM Reading: _____ Five Well Volumes: _____

Start Time: _____ Total Volumes Removed: _____

Time	Water Level (ft btoc)	Temp (°F/°C)	Spc. Cond. (µmhos/cm)	Turbidity (NTU)	pH (s.u.)

Observations/Comments: _____

_____

_____

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WATER SAMPLING LOG

Project _____ Project No. _____

Site Location _____ Date: _____

Site/Well No. _____ Replicate No. _____ Code No. _____

Weather _____ Sampling Time: Begin _____ End _____

Evacuation Data

Measuring Point _____

MP Elevation (ft) _____

Land Surface Elevation (ft) _____

Sounded Well Depth (ft bmp) _____

Depth To Water (ft bmp) _____

Water Level Elevation (ft) _____

Water Column In Well (ft) _____

Casing Diameter/Type _____

Gallons In Well _____

Gallons Pumped/Bailed Prior To Sampling _____

Sample Pump Intake Setting (ft bmp) _____

Purge Time Begin _____ End _____

Pumping Rate (gpm) _____

Evacuation Method _____

Field Parameters

Color _____

Odor _____

Appearance _____

pH (s.u.) _____

Conductivity (ms/cm) _____

Conductivity (µmhos/cm _____

Turbidity (NTU) _____

Temperature (^{O}C/ ^{O}F) _____

Dissolved Oxygen (mg/L) _____

ORP (mV) _____

Sampling Method _____

Remarks _____

Constituents Sampled	Container Description	Number	Preservative

Sampling Personnel

Well Casing Volumes

Gal./Ft.				
1" = 0.04	1 - 1/2" = 0.09	2 - 1/2" = 0.26	3 - 1/2" = 0.50	6" = 1.47
1 - 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	

bmp	Below measuring point	ml	Milliliter	NTU	Nephelometric Turbidity Units
^{O}C/^{O}F	Degrees Celsius/Fahrenheit	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	Feet	msl	Mean sea level	s.u.	Standard units
gpm	Gallons per minute	NA	Not Applicable	µmhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds
ppt	Parts per thousand	CS	Carbon steel	SS	Stainless steel

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Appendix C

Historical Monitor Well Network

TABLE 1

GROUNDWATER DATA LEVEL MEASUREMENTS

Piezometer or Well Number	Casing Elevation (ft msl)	Bottom Elevation (ft msl)	Top of Screen (ft msl)	November 1993 Groundwater Elevation (ft msl)
MW 1 A	113.01	83.01	93.51	108.39
MW 2	108.21	68.21	78.71	98.87
MW 3	99.33	69.33	79.83	
MW 4	114.70	94.70	105.20	106.89
MW 5	100.30	80.30	85.80	84.01
MW 6	100.76	73.78	79.28	86.48
MW 7	99.66	69.33	74.83	92.39
MW 8	110.83	80.83	86.33	103.14
MW 9	116.02	58.02	73.02	110.89
MW 10	114.73	61.73	74.73	107.40
MW 11	105.62	57.62	70.62	98.16
MW 12	112.06	64.56	80.06	109.32
MW 13	113.52	63.52	73.52	109.51
MW 14	113.9	57.9	67.9	107.64
MW 15	Plugged and abandoned during surface impoundment retrofit			
MW 16	111.84	58.84	68.84	108.84
PZ 12A (R)	137.87	66.97	72.97	107.64
PZ 12B (R)	137.27	105.27	111.27	123.48
PZ 19A	140.34	64.34	70.34	107.59
PZ 19B	140.22	120.22	126.22	124.46
PZ 20A	136.25	65.25	71.25	107.68
PZ 20B	136.43	103.43	109.43	114.50
PZ 21A	115.22	61.22	67.22	107.75
PZ 22A	112.71	61.71	67.71	107.11
PZ 22B	113.51	88.17	94.17	108.17
PZ 23A	112.49	66.49	72.49	107.27
PZ 23B	113.10	91.10	97.10	109.79
PZ 24B	113.16	85.16	91.16	107.21
PZ 25B	113.96	77.96	83.96	110.44

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Appendix D

Monitor Well Inspection Checklist

MONITOR WELL INSPECTION CHECKLIST

Project Name: _____ Project Number: _____

Inspectors Name: _____ Inspection Date: _____

Monitor Well ID: _____ Site Location: _____

Type of Well: ☐ Flush Mounted ☐ Above Grade

A. Condition of protective casing: _____

B. Condition of concrete pads (note cracks, breaks, slope direction): _____

_____

C. Condition of guard posts: _____

D. Is the well locked? _____

E. Is well identification number clearly marked? _____

F. Is the TOC elevation mark clearly visible on the well ? _____

G. Condition of well casing: _____

H. Condition of well cap: _____

I. Condition of surrounding grounds (i.e., overgrowth, is the well accessible, etc.): _____

J. Does water adequately drain from the well site?: _____

K. Total depth of well (properly decon tape between wells). _____

_____

L. Depth to top of grout from protective casing - length of protective casing above concrete pad: _____

M. Comments/Recommendations: _____

_____

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Appendix E

Remedial Site Conceptual Exposure Model

Worksheet

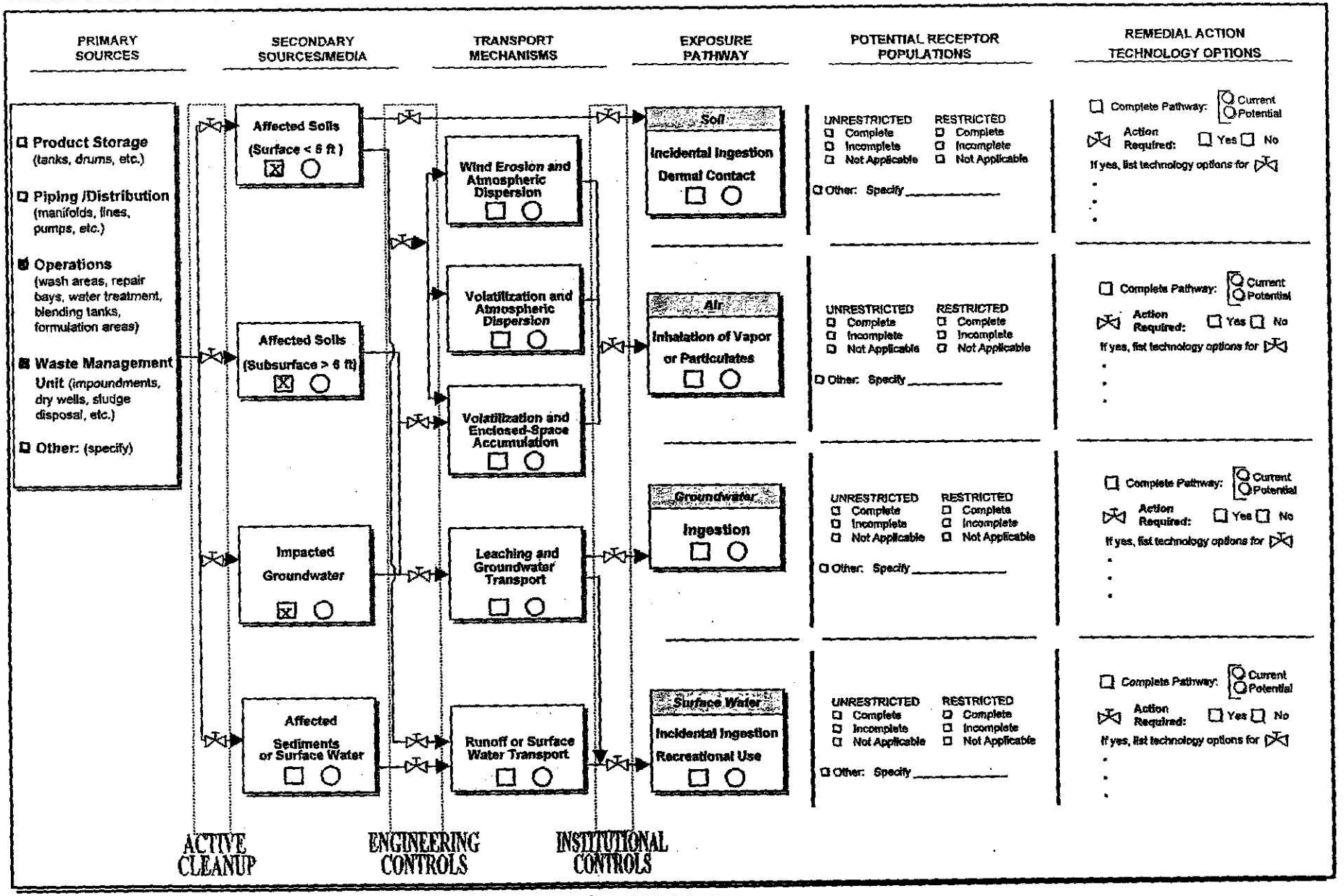
Remedial Site Conceptual Exposure Model (SCEM)

Site Name: Former Vicksburg Chemical Company
Site Location: Vicksburg Mississippi

Completed By: Craig Derouen
Revision Date: 11/20/06

☐ Complete ○ Potentially Complete

☒ Draft ☐ Final



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MISSISSIPPI BLUFFS INDUSTRIAL PARK, LLC

Site Baseline Sampling Work Plan

Former Vicksburg Chemical Company
Vicksburg, Mississippi

15 December 2006

ARCADIS

Site Baseline Sampling Work Plan

Former Vicksburg Chemical Company
Vicksburg, Mississippi

Craig A. Derouen, P.E.
Project Engineer

David R. Escudé, P.E.
Associate Vice President/Principal Engineer

Rudy J. Guichard
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Prepared for:
Mississippi Department of Environmental Quality and Mississippi Bluffs Industrial Park, LLC

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Fax 225 218 9677

Our Ref.:
LA002656.0001.00007

Date:
15 December 2006

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3 Summary of Methods, Containers, Preservatives, and Holding Times

4 Proposed Soil Sampling Parameters

5 Proposed Groundwater Sampling Parameters

6 Proposed Storm Water Sampling Parameters

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2 Proposed Soil Sampling Locations

3 Monitor Well Locations

4 Proposed Storm Water Sampling Locations

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A Sample Core Log

B Water Sampling Log

C Historical Monitor Well Network

D Monitor Well Inspection Checklist

E Remedial Site Conceptual Exposure Model

1. Introduction and Work Plan Rationale

1.1 Objectives/Rationale

This Work Plan presents a scope of work for performing sampling activities at the former Vicksburg Chemical Company (Vicksburg Chemical). The site was formerly a pesticide and herbicide manufacturing facility divided into two areas called the North Plant and South Plant. The primary objective of the activities proposed in this document will be to collect and evaluate soil, groundwater, and storm water data in accordance with the Mississippi Department of Environmental Quality (MDEQ) Brownfields program. Soil, groundwater, and storm water data will be acquired to further define present site conditions and to determine the regulatory and remediation paths forward.

All investigative sampling proposed in this Work Plan will be conducted in accordance with MDEQ's Brownfields program. MDEQ Brownfields Tier 1 Target Remediation Goals (TRGs) will be used as actionable standards. Waste characterization and disposal will be completed in accordance with MDEQ-approved methodology specific to this site. The use of MDEQ Brownfields investigative procedures and corrective action standards is appropriate in this investigation.

1.2 Property Background

1.2.1 Property Location

Vicksburg Chemical was formerly owned by Cedar Chemical Corporation (Cedar Chemical). The facility is located south of Interstate 20 on Rifle Range Road and within the southwest section of the city of Vicksburg, Warren County, Mississippi. The site is composed of approximately 535 acres located in Sections 4, 5, 8, 9, and 10, township 15 north, range 3 east (Latitude: North 32° 18' 01", Longitude: West 90° 53' 57"). The site location is shown on Figure 1.

1.2.2 Property History

The North Plant began operation in 1961 and produced potassium nitrate, liquid chlorine, and liquid nitrogen tetroxide. The raw materials for the North Plant included potassium chloride and nitric acid. The South Plant began operation in 1953 manufacturing chlorinated pesticides, nitrogen-based herbicides, and other agricultural chemicals. The only active operations at the South Plant after 1992 were the nitric acid

unit constructed in 1986 and a potassium carbonate unit constructed in 1994. During various periods prior to 1987, the South Plant produced dinitro butyl phenol (dinoseb or DNBP), monosodium methane arsenate (MSMA) diethyl hexyl phosphoric acid (DEHPA), 1-hydroxy-ethylidene-1-1-diphosphonic acid (UNIHIB), toxaphene, methyl parathion, cyanazine (bladex), and atrazine. Toxaphene and methyl parathion are insecticides, while atrazine, dinoseb, and MSMA are herbicides. Raw materials for these operating processes included chlorine, camphene, ortho-secondary butyl phenol (OSBP), sodium arsenate, sodium hydroxide, methyl chloride, sulfuric acid, sodium paranitrophenolate, and phosphorus trichloride.

Originally, the two plants were completely separate, owned and operated by two different companies. The South Plant was originally constructed by Spencer Chemical in 1953. American Metal Climax Corporation (Amax) constructed the North Plant in 1961. After purchasing the South Plant in 1964, Gulf Chemical added a formaldehyde unit in 1966. According to historical environmental documents, Vicksburg Chemical was formed in early 1972 and purchased both the Gulf Oil and Amax facilities (except the formaldehyde plant) in July 1972. In 1978, Vicksburg Chemical was merged into Vertac, Inc., which merged into Vertac Chemical Corporation (VCC) in September 1979. Cedar Chemical acquired the Vicksburg Chemical plant from VCC in February 1986. Fermenta A.B. of Sweden acquired Cedar Chemical in June 1986. Nine West Corporation (Trans Resources, Inc.) acquired Cedar Chemical in January 1988.

In addition to the above-mentioned operations at the plant, the property was the location of two additional operations: 1) an operation by Reagent Chemical to produce aqueous hydrochloric acid from a by-product of the toxaphene operation; and 2) the Gulf formaldehyde plant. The formaldehyde unit owned and formerly operated by Borden Chemical is located inside the former boundary of the South Plant.

1.3 Project History and Detailed Summary of Previous Investigation Activities

Vicksburg Chemical initiated a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) in 1994 and continued through 2001. The *RCRA Facility Investigation Draft Final Report* and *Draft Groundwater Assessment Report* were completed in August 2001 and November 2001, respectively. Both reports were submitted to the U.S. Environmental Protection Agency (USEPA) and subsequently approved in December 2001. A draft Corrective Measures Study was developed in the spring of 2002.

On March 8, 2002, VCC and Cedar Chemical filed for bankruptcy in the United States Bankruptcy Court for the Southern District of New York. The bankruptcy was contested by MDEQ, the Arkansas Department of Environmental Quality, USEPA Region 4, USEPA Region 6, and the U.S. Department of Justice. The court eventually approved an agreement allowing Vicksburg Chemical to abandon its properties and authorizing MDEQ to direct the transfer of the Vicksburg Chemical property to any entity identified by MDEQ. Since that time, MDEQ has kept the site under its control while structuring an agreement to clean up the plant site in a manner protective of human health and the environment. On December 19, 2005, MDEQ finalized an agreement for Mississippi Silvertip Development, LLC (Silvertip), to remediate the abandoned Vicksburg Chemical site. The developer, Silvertip, intends to create a Mississippi Bluffs Industrial Park to foster the sustainable reuse of the former chemical plant site and adjacent areas. It is anticipated that mixed use (i.e. light industrial, commercial, recreational, and residential) will be possible at the completion of the remedial action. Harcros Chemicals, Inc., is currently leasing portions of the former North Plant to facilitate a chemical blending, mixing, and distribution facility. Concurrently, ARCADIS G&M, Inc. (ARCADIS), is performing the remediation services with MDEQ oversight and control. Silvertip plans to construct high-end commercial and residential sites and a championship golf course on a majority of the remaining acreage.

1.4 Data Needs and Objectives

Additional site data are needed to sufficiently characterize soil contaminant boundaries for remediation purposes, to ascertain present groundwater contaminant concentrations, and to evaluate baseline storm water quality. Data collected as part of the RFI process have been used to select the additional sample locations and are considered valid and usable. The objective of this sampling effort is to collect soil, groundwater, and storm water samples representative of present site conditions that will define the overall remediation strategy for this site.

1.5 Work Plan Approach

The general Work Plan strategy was developed to obtain data representative of present site conditions. Since Vicksburg Chemical declared bankruptcy in 2002, the site has not been regularly investigated or maintained. The most recent soil and groundwater data on overall site conditions available to ARCADIS are contained in the RFI and supplemental investigations. This Work Plan is based in large part on the analytical data presented in the *RCRA Facility Investigation*

Draft Final Report (URS 2001a), *Draft Groundwater Assessment Report* (URS 2001b), and other reports that pertain to the project area. The analytical data contained in these reports were compared to the February 28, 2002, MDEQ Brownfields Tier 1 TRGs for soil and groundwater. The soil concentrations, with the exception of arsenic concentrations, were compared to Tier 1 TRGs for restricted sites as chemical of concern (CoC) concentrations at this site. Arsenic concentrations were compared to the 95 percent Upper Confidence Limit of the mean of the background concentration as presented in the *Quality Assurance Project Plan* (QAPP; ARCADIS 2006a). The soil and groundwater results obtained from the implementation of this Work Plan will help to determine if the site conditions have significantly changed since the last investigations.

The purpose of the storm water sampling is to evaluate if site CoC are present in storm water. If the storm water does contain CoC at unacceptable concentrations, treatment prior to discharge may be required. Areas likely to receive storm water in the form of sheet flow and sumps that historically collected storm water will be sampled during a rainfall event to provide the necessary baseline data.

While in operation, the Vicksburg Chemical plant operated under a State of Mississippi Water Pollution Control permit (Permit No. MS0027995). Storm water was discharged under this permit to the Mississippi River. The sampling parameters contained in the former Water Pollution Control permit are incorporated into the storm water sampling program.

2. Field Operations

2.1 Source Areas Characterization

Data presented in the RFI indicated five main impacted areas. These areas were defined in the QAPP as four distinct areas in the South Plant and one in the North Plant. The areas were designated:

- Area 1 – South Plant – Solid Waste Management Units (SWMUs) 1, 5, 7, 8, 9, 11, 12, 14, 15, 16, and 17;
- Area 2 – South Plant – Portion of Southwest Corner SWMU 20;
- Area 3 – South Plant – SWMU 2;

- Area 4 – South Plant – Part of SWMU 20 Bounded by MW-1, MW-13, and MW-14; and
- Area 5 – North Plant Pond – SWMU 23.

Each area contains CoC concentrations that exceed the MDEQ Tier 1 TRGs. Tables 1 and 2 list the sample designations where CoC concentrations exceed MDEQ Tier 1 TRGs in soil and groundwater, respectively.

The areal extent of surficial impacts, potential source areas for storm water contamination, has not been completely defined. One of the goals of this baseline sampling is to identify potential storm water contaminant source areas. Data may be used to redirect storm water from these areas to minimize the need for treatment prior to discharge.

2.2 Sampling Requirements

Some of the tasks that will be conducted during sampling activities have been outlined in detail in the QAPP. The pertinent sections are listed below and incorporated by reference.

2.2.1 Sampling Equipment and Procedures

Soil samples will be collected using direct push technology (Geoprobe®) and/or hand auger equipment. The proper use of these items in the collection of samples representative of site conditions is detailed in Sections 11.2 (Soil Boring/Sampling Geoprobe® Device) and 11.3 (Soil Sampling – Hand Auger) in the QAPP. Groundwater samples will be collected using low-flow purging techniques or with a bailer as described in Section 11.6 (Groundwater Sampling Procedures) in the QAPP. Storm water samples will be collected in accordance with the procedures described in Section 10.6 (Sample Collection Protocols) in the QAPP.

2.2.2 Sample Handling and Analysis

Sample handling and analysis were discussed in detail in Sections 10 and 11 of the QAPP. These procedures will be followed during the implementation of this Work Plan. Table 6 (Summary of Methods, Containers, Preservatives, and Holding Times) of the QAPP contains information relative to specific analyses. This table was revised to include additional storm water parameters not included in the original table. The

following parameters were added: Total Phosphorus (as P) and Fluoride (as F). The revised table is included as Table 3 of this Work Plan.

2.2.3 Quality Assurance/Quality Control (QA/QC) Samples

Appropriate QA/QC samples will be prepared in accordance with the procedures outlined in Section 10.12 (Field Quality Control Samples) of the QAPP. The QA/QC samples will include:

- Field blanks;
- Equipment rinsate blanks;
- Duplicate samples; and
- Matrix spike/matrix spike duplicate samples.

QA/QC samples will be collected at a frequency of 1 per each 20 samples of each matrix. Trip blanks will be included in ice chests used to transport the samples to the receiving laboratory. The sampling personnel will complete a chain-of-custody form that will accompany the samples to the laboratory.

2.3 Extent of Contamination in Soil

Soil contamination at the site has been extensively investigated through the RFI process. Due to the nature of the proposed remedies for soil contamination (capping, solidification, stabilization, landfilling), the horizontal delineation of CoC boundaries is critical. To adequately provide sufficient protection of human health and the environment, soil samples will be collected from the locations shown on Figure 2 to confirm and more precisely locate contaminant boundaries. The results of the soil sampling will be used in the development of the final remedy for each area.

2.3.1 Soil Sampling and Analysis Plan (SAP)

A Geoprobe® sampling unit will be used to advance probeholes for the collection of subsurface data at each of the sampling locations depicted on Figure 2. The Geoprobe® is a preferred technique for subsurface sampling in shallow unconsolidated materials because it minimizes the generation of soil cuttings and the introduction of foreign fluids into the probehole.

All drilling equipment will be properly decontaminated prior to advancing each probehole. This will be accomplished by thoroughly cleaning the Geoprobe® drive assembly to remove all soil residues.

The probehole at each location will be advanced and sampled to a depth sufficient to complete delineation of surface and subsurface impacts.

Soil samples will be continuously collected from land surface to total depth (estimated to be less than 12 feet below ground surface (ft bls) based on previous RFI data), as each probehole is being advanced. As each soil sample is retrieved to land surface, the sampling tube will be cut open and the sample removed (sampling personnel will wear clean gloves when handling each sample). The sides of the core will be trimmed away with a decontaminated stainless steel knife to allow for the collection of an undisturbed sample. The sample will be used to fill the appropriate laboratory-provided sample containers. Samples collected for the analysis of volatile organic compounds will be collected by USEPA SW-846 Method 5035. All sample containers will be labeled and placed into an ice bath within an insulated ice chest.

Any remaining soil sample will be inspected and described by an experienced field geologist with all relevant data (i.e., soil type, lithology, color, physical characteristics, moisture content, and any observed evidence of contamination) recorded onto a Sample/Core Log prepared for each probehole. The Sample/Core Log will present a complete description of the soil lithology encountered from land surface to the total depth of the probehole. Appendix A includes an example of the Sample/Core Log.

The samples will be submitted to the laboratory under proper chain-of-custody protocols. Selected parameters will be analyzed in accordance with the data presented in Table 3 specific to each analysis. At a minimum, the soil samples will be analyzed for the analytical parameters proposed in Table 4, or an analytical parameter set provided by MDEQ.

Soil samples collected from the following intervals in each probehole will be retained for chemical analyses:

- The soil sample collected from land surface to 2 ft bls;
- The soil sample collected from 2 to 4 ft bls; and

- A sample from any obvious stained intervals below 4 ft bls if the 2- to 4-ft bls sample appears to be stained.

2.3.2 Soil Sampling Objectives

The specific objective of soil sampling is to define the horizontal extent of contamination in the areas shown on Figure 2. These data will be used to identify the extent of areas that will need to be capped as a part of the final remedy. The present interpretation of the data indicates that soil capping activities will be needed in Areas 1, 4, and 5.

2.3.3 Soil Sampling Locations and Frequency

The soil sampling locations were selected to fill data gaps based on the spatial distribution of previous sampling events. The proposed soil sampling activities are anticipated to be a one-time sampling event. In the event that soil CoC concentrations are detected in excess of limiting MDEQ Tier 1 TRGs, additional sampling may be necessary to adequately define contaminant boundaries.

2.4 Extent of Contamination in Groundwater

Groundwater contamination at the site has been extensively investigated through the RFI process. Previous sampling events indicated contaminant plumes extending toward Stouts Bayou to the east and Hennessey Bayou to the south. Due to the extended amount of time that has elapsed since the last sampling of all wells, a baseline groundwater sampling event is necessary to confirm present groundwater conditions. It is necessary to conduct the sampling proposed in this Work Plan prior to implementing the final groundwater remedy. Based on the results of the baseline groundwater sampling, additional monitor wells may be necessary to adequately define current groundwater conditions. A map showing the well locations is included as Figure 3.

2.4.1 Groundwater SAP

Prior to collecting the groundwater samples, static water level measurements will be recorded in all temporary wells, and each well will be checked for the presence of any free-phase material.

Groundwater samples will be collected from each well using either a small-diameter hand bailer, high volume pump (i.e. Redi-flo® pump), flow through cell, or a peristaltic pump. In accordance with the procedures outlined in Section 11.6 of the QAPP, sampling will be conducted using low-flow procedures or each well will be purged of three to five volumes of standing water (or until dry) prior to collecting a groundwater sample. Each groundwater sample will be poured directly into the appropriate laboratory-provided sample container(s), the containers properly labeled, and placed in an ice bath within an insulated ice chest. Separate aliquots of groundwater will then be collected from each well for field measurements of pH, specific conductance, and temperature. As each well is being sampled, a Water Sampling Log (Appendix B) will be completed by sampling personnel.

The samples will be submitted to the laboratory under proper chain-of-custody protocols. Selected parameters will be analyzed in accordance with the data presented in Table 3 specific to each analysis. At a minimum, the groundwater samples will be analyzed for the analytical parameters proposed in Table 5, or an analytical parameter set provided by MDEQ.

2.4.2 Groundwater Sampling and Objectives

The specific objective of groundwater sampling is to define the present condition of groundwater in the existing monitor wells and determine if the network sufficiently monitors the existing known groundwater impacts.

2.4.3 Groundwater Sampling Locations and Frequency

The existing groundwater monitor well network consists of 37 wells. No new monitor or recovery wells are proposed to be installed during this sampling event. Well construction data for the monitor wells were obtained from Table 1 of the *Draft Groundwater Assessment Report* (URS 2001b). The locations of the wells are shown on Figure 3. A copy of Table 1 is presented in Appendix C. The exact condition of each well is presently unknown. However, a monitor well inspection will be conducted at each well during the baseline sampling event and a checklist prepared. A copy of the checklist is included in Appendix D. It is assumed that the wells are in good enough condition to provide samples representative of the groundwater zone in which the well was initially completed. The baseline groundwater sampling activities proposed herein are anticipated to be a one-time sampling event. Based on the results, a routine sampling frequency and parameter list will be proposed to MDEQ in the Site Characterization Report for future sampling activities. In the event that

groundwater CoC concentrations are detected in excess of limiting MDEQ Tier 1 TRGs, additional sampling and or well installation activities may need to be conducted to adequately monitor groundwater concentrations prior to the submission of the Site Characterization Report.

2.5 Storm Water Sampling

2.5.1 Storm Water SAP

Storm water samples will be collected from various locations at the site as shown on Figure 4. Samples will be collected during a storm water event of sufficient intensity and duration to collect a sample representative of sheet flow conditions. Each storm water sample will be a grab sample collected in clean containers supplied by the laboratory. Dippers, bailers, or similar sampling equipment may be used, if necessary, to collect a representative sample. If not, sample containers will be lowered to the surface of the storm water for filling. Once filled, the containers will be properly sealed, labeled, and placed in an ice bath within an insulated ice chest. The ice chest and a completed chain-of-custody document will be shipped or transported to the laboratory.

The samples will be submitted to the laboratory under proper chain-of-custody protocols. Selected parameters will be analyzed in accordance with the data presented in Table 3 specific to each analysis. At a minimum, the storm water samples will be analyzed for the analytical parameters contained in Table 6, or an analytical parameter set provided by MDEQ. The storm water parameters identified in Table 6 were contained in Vicksburg Chemical's previous State of Mississippi Water Pollution Control permit (MS0027995).

2.5.2 Storm Water Sampling Objectives

The specific objectives of storm water sampling are:

- To determine potential areas that may adversely impact site storm water; and
- To determine if any best management practices and/or storm water treatment is necessary prior to discharge to the Mississippi River.

2.5.3 Storm Water Sampling Locations and Frequency

The proposed storm water sampling locations are presented on Figure 3. The majority of the locations shown on this map are sheet flow sample locations. In addition to the sheet flow sample locations, storm water sumps, storm water basins, and the storm water outfall will be sampled. The activities proposed in this document are intended to be a one-time baseline sampling event. The purpose of the baseline sampling is to determine if treatment is necessary and define the sample points and parameter set(s) that should continue to be monitored in future storm water sampling events.

2.6 Investigation Derived Wastes

Waste materials generated during this investigation and corrective action will include soil, used personal protective equipment, decontamination water, and purged groundwater. Waste materials will be appropriately containerized or placed into the storm water basin with approval from MDEQ. All drums will be labeled with the contents of the drum and date of generation of the waste material. The drums will be staged in a secure location and will be incorporated into the remediation to be conducted at the site. Liquid and solid waste will be segregated to facilitate final disposal.

2.7 Regulatory Involvement

All site activities will be conducted after receiving approval of this Work Plan from MDEQ. MDEQ will have oversight on all aspects of remediation activities conducted at this site as per the Agreed Order. Future sampling frequencies, parameter lists, methodology, etc., will be approved by MDEQ prior to field implementation.

All wells advanced by direct push technology methods will be plugged by a State of Mississippi certified water well driller in accordance with MDEQ-approved methods. The plugging and abandonment will be conducted with a cement/bentonite mixture, or a material that provides equivalent subsurface protection.

2.8 Additional Work

A registered land surveyor will survey all soil sample points and monitor well locations. These locations will be plotted on a scaled map of the site.

3. Remedial Site Conceptual Exposure Model

A draft Remedial Site Conceptual Exposure Model (RSCEM) form for the site is presented in Appendix E. The RSCEM is an important tool for obtaining an understanding of site exposure pathway dynamics. It depicts the site and its environment(s) and delineates potential chemical sources, chemical release and transport mechanisms, affected media, migration routes, and potential human and ecological receptors. The RSCEM provides a framework for problem definition, aids in the identification of data gaps, and, more importantly, identifies key exposure pathways and associated media on which to focus assessment activities.

The RSCEM represents potential exposure pathways under both current and foreseeable future exposure scenarios. An industrial exposure scenario will be considered for the portion of the site that was the former Vicksburg Chemical plant. The apparent release source is the former site operations. The RSCEM identifies soil and groundwater as the media of concern. Potential receptors include current and future industrial workers and site visitors and hypothetical future recreational receptors via groundwater/surface water exchange. The final remediation will address the exposure pathways to protect potential receptors.

4. Reporting

Following the completion of all field activities, a Site Characterization Report will be prepared for submittal to MDEQ. The report will document all field activities and present an interpretation of surface and subsurface conditions. Appropriate historical and new data tables, figures, and appendices will be included in the report to support the text. The report will conclude by presenting recommendations for a path forward to obtain site closure.

5. Schedule

The sampling program will be initiated within 3 weeks of receiving written authorization to proceed from MDEQ. It is anticipated that the planned field activities can be completed within 3 to 4 weeks. Analytical data should be received within 2 weeks of completing the last planned field activities. A Site Characterization Report will be prepared and submitted to MDEQ within 8 weeks of receipt of the analytical results. If field activities are delayed, or if additional field activities are required to completely define the nature and extent of subsurface impacts, MDEQ will be promptly notified.

6. References

ARCADIS. 2006a. Quality Assurance Project Plan, Vicksburg Chemical Company. September 14.

ARCADIS. 2006b. Health and Safety Plan, Vicksburg Chemical Company. October 27.

MDEQ. Brownfields Site Characterization Work Plan Format. http://www.deq.state.ms.us/MDEQ.nsf/pdf/GARD_bfwplan/$File/BFWPlan.PDF?OpenElement.

MDEQ. 2002. Subpart II Risk Evaluation Procedures for Voluntary Cleanup and Redevelopment of Brownfield Sites. February 28.

URS. 2001a. RCRA Facility Investigation Draft Final Report, Vicksburg Chemical Company. August.

URS. 2001b. Draft Groundwater Assessment Report, Vicksburg Chemical Company. November.

Table 1. Exceedances of MDEQ Tier 1 TRG for Restricted Soil Use, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Sample Depth (ft)	Chemical of Concern	Site Concentration[1]	MDEQ Tier 1 TRG (Restricted)	Units	Concentration Exceeds Tier 1 TRG (Restricted)
Soil Samples							
1, 16, 17	D-1-B	0-1	Arsenic	12,500	11,800	µg/kg	Yes
1, 16, 17	I-1-B	0-1	Toxaphene	31,700	5,200	µg/kg	Yes
1, 16, 17	I-1-B	0-1	Arsenic	27,000	11,800	µg/kg	Yes
1, 16, 17	L-1-A	0-1	Arsenic	14,500	11,800	µg/kg	Yes
1, 16, 17	2-C-C	Concrete	Arsenic	36,000	11,800	µg/kg	Yes
1, 16, 17	11-C-C	Concrete	Atrazine	52,800	25,800	µg/kg	Yes
1, 16, 17	12-2-A	1-2	Arsenic	13,300	11,800	µg/kg	Yes
1, 16, 17	15-2-A	1-2	Arsenic	12,900	11,800	µg/kg	Yes
1, 16, 17	16-C-A	Concrete	Arsenic	13,700	11,800	µg/kg	Yes
1, 16, 17	18-C-A	Concrete	Arsenic	27,000	11,800	µg/kg	Yes
1, 16, 17	19-C-A	Concrete	Arsenic	18,800	11,800	µg/kg	Yes
4	4-4	0.5-1	Arsenic	15,700	11,800	µg/kg	Yes
5	5-4	3-10	Arsenic	39,200	11,800	µg/kg	Yes
5	5-11	3-10	Arsenic	30,800	11,800	µg/kg	Yes
5	5-13	3-10	Arsenic	174,000	11,800	µg/kg	Yes
5	5-14	3-10	Arsenic	39,000	11,800	µg/kg	Yes
9	8S	0.5-1	Arsenic	61,000	11,800	µg/kg	Yes
9	8D	1.5-2	Arsenic	60,000	11,800	µg/kg	Yes
9	A-1 Result		Benzo(a)pyrene	1,160	784	µg/kg	Yes
11, 12, 15	B-1-D (Sump/Drainage)	0-1	Arsenic	39,400	11,800	µg/kg	Yes
11, 12, 15	E-1-D (Sump/Drainage)	0-1	Arsenic	345,000	11,800	µg/kg	Yes
11, 12, 15	BB-1-D (Sump/Drainage)	0-1	Arsenic	2,870,000	11,800	µg/kg	Yes
11, 12, 15	Q-1-D (Sump/Drainage)	0-1	Arsenic	2,080,000	11,800	µg/kg	Yes
11, 12, 15	EE-1-D (Sump/Drainage)	0-1	Arsenic	456,000	11,800	µg/kg	Yes
11, 12, 15	EE-1-D (Sump/Drainage)	0-1	PCDD/PCDF (Dioxin)	0.344	0.0763	µg/kg	Yes
11, 12, 15	V-1-D (Sump/Drainage)	0-1	Arsenic	2,770,000	11,800	µg/kg	Yes
11, 12, 15	W-1-D (Sump/Drainage)	0-1	Arsenic	145,000	11,800	µg/kg	Yes
11, 12, 15	Y-1-D (Sump/Drainage)	0-1	Arsenic	60,200	11,800	µg/kg	Yes
11, 12, 15	M-1-D (Sump/Drainage)	0-1	Arsenic	35,600	11,800	µg/kg	Yes
11, 12, 15	1-C-D	Concrete	Arsenic	18,400	11,800	µg/kg	Yes
11, 12, 15	5-C-D	Concrete	Arsenic	70,600	11,800	µg/kg	Yes
11, 12, 15	6-1-D	0-1	Arsenic	24,900	11,800	µg/kg	Yes
11, 12, 15	6-2-D	1-2	Arsenic	14,100	11,800	µg/kg	Yes
11, 12, 15	C-1-G	0-1	Arsenic	216,000	11,800	µg/kg	Yes
11, 12, 15	C-2-G	1-2	Arsenic	501,000	11,800	µg/kg	Yes
11, 12, 15	C-3-G	2-4	Arsenic	76,000	11,800	µg/kg	Yes

Table 1. Exceedances of MDEQ Tier 1 TRG for Restricted Soil Use, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Sample Depth (ft)	Chemical of Concern	Site Concentration[1]	MDEQ Tier 1 TRG (Restricted)	Units	Concentration Exceeds Tier 1 TRG (Restricted)
Soil Samples (continued)							
11, 12, 15	C-4-G	4-6	Arsenic	109,000	11,800	µg/kg	Yes
11, 12, 15	C-5-G	6-8	Arsenic	114,000	11,800	µg/kg	Yes
11, 12, 15	D-1-G	0-1	Arsenic	48,800	11,800	µg/kg	Yes
11, 12, 15	D-2-G	1-2	Arsenic	309,000	11,800	µg/kg	Yes
11, 12, 15	D-4-G	4-6	Arsenic	27,600	11,800	µg/kg	Yes
11, 12, 15	D-5-G	6-8	Arsenic	14,700	11,800	µg/kg	Yes
11, 12, 15	H-1-G	0-1	Arsenic	22,300	11,800	µg/kg	Yes
11, 12, 15	I-1-G	0-1	Arsenic	72,800	11,800	µg/kg	Yes
11, 12, 15	I-2-G	1-2	Arsenic	57,500	11,800	µg/kg	Yes
11, 12, 15	I-3-G	2-4	Arsenic	185,000	11,800	µg/kg	Yes
11, 12, 15	I-4-G	4-6	Arsenic	241,000	11,800	µg/kg	Yes
11, 12, 15	I-5-G	6-8	Arsenic	138,000	11,800	µg/kg	Yes
11, 12, 15	J-1-G	0-1	Arsenic	101,000	11,800	µg/kg	Yes
11, 12, 15	J-2-G	1-2	Arsenic	205,000	11,800	µg/kg	Yes
11, 12, 15	K-1-G	0-1	Arsenic	38,800	11,800	µg/kg	Yes
11, 12, 15	K-2-G	1-2	Arsenic	31,500	11,800	µg/kg	Yes
11, 12, 15	K-3-G	2-4	Arsenic	14,600	11,800	µg/kg	Yes
11, 12, 15	K-4-G	4-6	Arsenic	46,000	11,800	µg/kg	Yes
11, 12, 15	K-6-G	8-10	Arsenic	55,100	11,800	µg/kg	Yes
11, 12, 15	L-1-G	0-1	Arsenic	132,000	11,800	µg/kg	Yes
11, 12, 15	L-2-G	1-2	Arsenic	80,600	11,800	µg/kg	Yes
11, 12, 15	O-1-G	0-1	Arsenic	254,000	11,800	µg/kg	Yes
11, 12, 15	O-2-G	1-2	Arsenic	41,400	11,800	µg/kg	Yes
11, 12, 15	T-2-G	1-2	Arsenic	14,400	11,800	µg/kg	Yes
11, 12, 15	X-1-G	0-1	Arsenic	64,400	11,800	µg/kg	Yes
11, 12, 15	X-2-G	1-2	Arsenic	63,300	11,800	µg/kg	Yes
11, 12, 15	Z-1-G	0-1	Arsenic	323,000	11,800	µg/kg	Yes
11, 12, 15	Z-2-G	1-2	Arsenic	51,200	11,800	µg/kg	Yes
11, 12, 15	Z-3-G	2-4	Arsenic	22,300	11,800	µg/kg	Yes
11, 12, 15	DD-1-G	0-1	Arsenic	24,300	11,800	µg/kg	Yes
11, 12, 15	DD-2-G	1-2	Arsenic	59,600	11,800	µg/kg	Yes
11, 12, 15	ZZ-1-G	0-1	Arsenic	11,900	11,800	µg/kg	Yes
11, 12, 15	ZZ-2-G	1-2	Arsenic	18,100	11,800	µg/kg	Yes
11, 12, 15	7-C-G	Concrete	Arsenic	68,200	11,800	µg/kg	Yes
18	18-1	0.5-1	Arsenic	17,500	11,800	µg/kg	Yes
18	18-3	0.5-1	Arsenic	12,800	11,800	µg/kg	Yes
20	20-21C		Chloroform	2,186	478	µg/kg	Yes
23	22-B		Chloroform	830	478	µg/kg	Yes
30	30-1	0.5-1	TPH (conservative)	4,433,000	300,000	µg/kg	Yes
30	30-2	0.5-1	TPH (conservative)	699,000	300,000	µg/kg	Yes
30	30-3	0.5-1	TPH (conservative)	15,431,000	300,000	µg/kg	Yes

Table 1. Exceedances of MDEQ Tier 1 TRG for Restricted Soil Use, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Sample Depth (ft)	Chemical of Concern	Site Concentration(1)	MDEQ Tier 1 TRG (Restricted)	Units	Concentration Exceeds Tier 1 TRG (Restricted)
Composite Surface Samples (2 to 8 grab samples from each quartile of each section composited)							
20	20-A	0-0.5	Toxaphene	8,240	5,200	µg/kg	Yes
20	20-B	0-0.5	Toxaphene	18,989	5,200	µg/kg	Yes
20	20-C	0-0.5	Dinoseb	355,541	204,000	µg/kg	Yes
20	20-C	0-0.5	Toxaphene	8,401	5,200	µg/kg	Yes
20	20-D	0-0.5	Toxaphene	14,200	5,200	µg/kg	Yes
20	20-F	0-0.5	Dinoseb	1,078,068	204,000	µg/kg	Yes
20	20-F	0-0.5	Toxaphene	10,318	5,200	µg/kg	Yes
20	20-G	0-0.5	Toxaphene	22,981	5,200	µg/kg	Yes
20	20-H	0-0.5	Toxaphene	19,052	5,200	µg/kg	Yes
20	20-I	0-0.5	Toxaphene	110,964	5,200	µg/kg	Yes
20	20-J	0-0.5	Toxaphene	41,652	5,200	µg/kg	Yes
20	20-K	0-0.5	Toxaphene	6,098	5,200	µg/kg	Yes
20	20-N	0-0.5	Toxaphene	9,263	5,200	µg/kg	Yes
20	20-O	0-0.5	Toxaphene	6,727	5,200	µg/kg	Yes
20	20-T	0-0.5	Arsenic	12,100	11,800	µg/kg	Yes
20	20-T	0-0.5	Toxaphene	7,617	5,200	µg/kg	Yes
Composite Soil Pile Samples (8 grab samples composited)							
20	20-BB	0-0.5	Toxaphene	37,036	5,200	µg/kg	Yes
20	20-CC	0-0.5	Toxaphene	6,852	5,200	µg/kg	Yes
20	20-DD	0-0.5	Toxaphene	14,691	5,200	µg/kg	Yes
20	20-EE	0-0.5	Toxaphene	16,815	5,200	µg/kg	Yes
20	20-FF	0-0.5	Toxaphene	76,683	5,200	µg/kg	Yes
20	20-II	0-0.5	Toxaphene	17,413	5,200	µg/kg	Yes
20	20-LL	0-0.5	Toxaphene	14,673	5,200	µg/kg	Yes
20	20-MM	0-0.5	Toxaphene	11,152	5,200	µg/kg	Yes

(1) Analytical data obtained from RFI process.
MDEQ Mississippi Department of Environmental Quality.
SWMU Solid Waste Management Unit.
Tier 1 TRG (Restricted) MDEQ Tier 1 TRG for the restricted use of soil.
TPH Total Petroleum Hydrocarbon.
TRG Target Remediation Goal.
µg/kg Micrograms per Kilogram.

Table 2. Exceedances of MDEQ Tier 1 TRG for Groundwater, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Chemical of Concern	Site Concentration[1]	MDEQ Tier 1 TRG	Units	Concentration Exceeds Tier 1 TRG
1, 16, 17	2-W-TA	Arsenic	538	50	µg/L	Yes
2	MW-5	Dinoseb	12	7	µg/L	Yes
2	MW-5	Trichloroethene	79	5	µg/L	Yes
2	MW-6	Dinoseb	75	7	µg/L	Yes
2	MW-6	Toxaphene	25	3	µg/L	Yes
2	MW-6	Trichloroethene	9.03	5	µg/L	Yes
2	LS1-W	Bis(2-ethyl)hexylphthalate	213.44	6	µg/L	Yes
2	LS2-W	4-Nitrophenol	547.61	292	µg/L	Yes
2	LS2-W	Atrazine	478	3	µg/L	Yes
2	LS2-W	Carbon Tetrachloride	71.4	5	µg/L	Yes
2	LS2-W	Dinoseb	8,714	7	µg/L	Yes
2	LS3-W	Bis(2-ethyl)hexylphthalate	474.04	6	µg/L	Yes
2	LS4-W	Chloroform	17.3	0.155	µg/L	Yes
2	LS4-W	Carbon Tetrachloride	126	5	µg/L	Yes
2	LS4-W	Bis(2-ethyl)hexylphthalate	42.03	6	µg/L	Yes
2	LS4-W	Dinoseb	597	7	µg/L	Yes
2	LS5-W	Chloroform	105	0.155	µg/L	Yes
2	LS5-W	Acetophenone	18.92	0.0416	µg/L	Yes
2	LS5-W	4-Nitrophenol	2,359	292	µg/L	Yes
2	LS5-W	Bis(2-ethyl)hexylphthalate	130.9	6	µg/L	Yes
2	LS5-W	Atrazine	6.33	3	µg/L	Yes
2	LS5-W	Dinoseb	797	7	µg/L	Yes
2	2-15-W	Atrazine	123	3	µg/L	Yes
9	TP-1	Arsenic	378	50	µg/L	Yes
9	TP-1	Trichloroethene	68	5	µg/L	Yes
9	MW-18A	Arsenic	319	50	µg/L	Yes
9	MW-18B	Arsenic	197	50	µg/L	Yes
9	MW-18B	Dinoseb	132	7	µg/L	Yes
11, 12, 15	G-W-G	Arsenic	14,300	50	µg/L	Yes
11, 12, 15	D-W-G	Arsenic	253	50	µg/L	Yes
11, 12, 15	I-W-G	Arsenic	288,000	50	µg/L	Yes
11, 12, 15	K-W-G	Arsenic	297	50	µg/L	Yes
11, 12, 15	R-W-G	Arsenic	5,260	50	µg/L	Yes
11, 12, 15	X-W-G	Arsenic	730	50	µg/L	Yes
11, 12, 15	Z-W-G	Arsenic	1,720	50	µg/L	Yes
11, 12, 15	DD-W-G	Arsenic	1,260	50	µg/L	Yes
11, 12, 15	WW-W-G	Arsenic	56	50	µg/L	Yes
11, 12, 15	ZZ-W-G	Arsenic	216	50	µg/L	Yes
11, 12, 15	7-W-G	Arsenic	51,000	50	µg/L	Yes
11, 12, 15	MW-17A	Carbon Tetrachloride	7.25	5	µg/L	Yes
11, 12, 15	MW-17B	Chloroform	1.43	0.155	µg/L	Yes
11, 12, 15	MW-18A	Arsenic	319	50	µg/L	Yes
11, 12, 15	MW-18B	Arsenic	194	50	µg/L	Yes
11, 12, 15	MW-18B	Dinoseb	132	7	µg/L	Yes
20	MW-1C	Chloroform	1.38	0.155	µg/L	Yes
20	MW-1C	Trichloroethene	10.8	5	µg/L	Yes
20	MW-10C	Dinoseb	717	7	µg/L	Yes

Table 2. Exceedances of MDEQ Tier 1 TRG for Groundwater, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Chemical of Concern	Site Concentration[1]	MDEQ Tier 1 TRG	Units	Concentration Exceeds Tier 1 TRG
20	MW-10C	Chloroform	1,076	0.155	µg/L	Yes
20	MW-10C	Carbon Tetrachloride	1,486	5	µg/L	Yes
20	MW-12C	Dinoseb	277	7	µg/L	Yes
20	MW-12C	Vinyl Chloride	13	2	µg/L	Yes
20	MW-12C	1,1-Dichloroethene	7.39	7	µg/L	Yes
20	MW-12C	1,2-Dichloroethene (total)	88.3	70	µg/L	Yes
20	MW-12C	Chloroform	3,879	0.155	µg/L	Yes
20	MW-12C	1,2-Dichloroethane	113	5	µg/L	Yes
20	MW-12C	Carbon Tetrachloride	23,350	5	µg/L	Yes
20	MW-12C	1,1,2-Trichloroethane	84.2	5	µg/L	Yes
20	MW-12C	Tetrachloroethene	174	5	µg/L	Yes
20	20-18-W	Atrazine	65	3	µg/L	Yes
20	20-18-W	Chloroform	21.5	0.155	µg/L	Yes
20	20-18-W	Carbon Tetrachloride	13.3	5	µg/L	Yes
20	20-18-W	Benzene	9.58	5	µg/L	Yes
20	20-19-W	Benzene	7.21	5	µg/L	Yes
20	20-20-W	Dinoseb	18,821	7	µg/L	Yes
20	20-20-W	Chloromethane	3.36	1.43	µg/L	Yes
20	20-20-W	Chloroform	10.2	0.155	µg/L	Yes
20	20-20-W	Carbon Tetrachloride	46.2	5	µg/L	Yes
20	20-21-W	Atrazine	140	3	µg/L	Yes
20	20-21-W	Chloromethane	126	1.43	µg/L	Yes
20	20-21-W	Vinyl Chloride	5.46	2	µg/L	Yes
20	20-21-W	Methylene Chloride	908	5	µg/L	Yes
20	20-21-W	1,1-Dichloroethene	54.6	7	µg/L	Yes
20	20-21-W	1,2-Dichloroethene (total)	1,758	70	µg/L	Yes
20	20-21-W	Chloroform	37,380	0.155	µg/L	Yes
20	20-21-W	1,2-Dichloroethane	321	5	µg/L	Yes
20	20-21-W	Carbon Tetrachloride	357,500	5	µg/L	Yes
20	20-21-W	Bromodichloromethane	296	0.168	µg/L	Yes
20	20-21-W	cis-1,3-Dichloropropene	42.3	0.0842	µg/L	Yes
20	20-21-W	Trichloroethene	1,346	5	µg/L	Yes
20	20-21-W	Benzene	23.7	5	µg/L	Yes
20	20-21-W	1,1,2-Trichloroethane	290	5	µg/L	Yes
20	20-21-W	Tetrachloroethene	180	5	µg/L	Yes
20	20-22-W	Atrazine	146	3	µg/L	Yes
20	20-22-W	Dinoseb	396	7	µg/L	Yes
20	20-22-W	Vinyl Chloride	46.5	2	µg/L	Yes
20	20-22-W	Methylene Chloride	45.7	5	µg/L	Yes
20	20-22-W	1,2-Dichloroethene (total)	125	70	µg/L	Yes
20	20-22-W	Chloroform	5,120	0.155	µg/L	Yes
20	20-22-W	1,2-Dichloroethane	68.2	5	µg/L	Yes
20	20-22-W	Carbon Tetrachloride	4,705	5	µg/L	Yes
20	20-22-W	Bromodichloromethane	75.8	0.168	µg/L	Yes
20	20-22-W	1,2-Dichloropropane	11.2	5	µg/L	Yes
20	20-22-W	Trichloroethene	44.6	5	µg/L	Yes
20	20-22-W	Benzene	9.33	5	µg/L	Yes

Table 2. Exceedances of MDEQ Tier 1 TRG for Groundwater, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

SWMU	Sample ID	Chemical of Concern	Site Concentration(1)	MDEQ Tier 1 TRG	Units	Concentration Exceeds Tier 1 TRG
20	20-22-W	1,1,2-Trichloroethane	74.4	5	µg/L	Yes
20	20-22-W	Tetrachloroethene	55.2	5	µg/L	Yes
20	20-23-W	Atrazine	30	3	µg/L	Yes
20	20-23-W	Dinoseb	27	7	µg/L	Yes
23	20-B	Chloroform	1,700	0.155	µg/L	Yes
23	20-B	Bromodichloromethane	36	0.168	µg/L	Yes
23	20-B	Dibromochloromethane	14	0.126	µg/L	Yes
23	22-A	Chloroform	44	0.155	µg/L	Yes
23	22-B	Chloroform	1,600	0.155	µg/L	Yes
23	22-B	Bromodichloromethane	66	0.168	µg/L	Yes
23	22-B	Dibromochloromethane	78	0.126	µg/L	Yes
23	22-B	Bromoform	160	8.48	µg/L	Yes
23	23-B	Chloroform	79	0.155	µg/L	Yes
23	22-1-W	Chloroform	6.78	0.155	µg/L	Yes

(1) Analytical data obtained from RFI process.
MDEQ Mississippi Department of Environmental Quality.
SWMU Solid Waste Management Unit.
Tier 1 TRG MDEQ Tier 1 TRG for Groundwater.
TRG Target Remediation Goal.
µg/L Micrograms per Liter.

Table 3. Summary of Methods, Containers, Preservatives, and Holding Times, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Matrix	Preparation Method	Analytical Method [a]	Container [b]	Preservative	Holding Time [c]
General Parameters						
VOCs	Water	5030, 5032	8260/624	3 x 40-mL vial with Teflon lined septum	pH < 2 with HCl, Cool 4°C	14 days
	Water	5030, 5032	8260/624	3 x 40-mL vial with Teflon lined septum	If effervescence is observed, eliminate HCl preservative and Cool 4°C	7 days
	Solid	5035	8260	3 x Encore™ OR 2 x Sodium Bisulfate vial	Cool 4°C	48 hours to preservation for Encore™, then 14 days to
SVOCs	Water	3510, 3520 [d]	8270 (Low Level)/625	2 x 1-L amber G	Cool 4°C [e]	7 days to extraction and 40 days to analysis
	Solid	3540, 3550 [d]	8270 (Low Level)	1 x 4-oz or 8-oz G	Cool 4°C	14 days to extraction and 40 days to analysis
Organochlorine Pesticides	Water	3510, 3520 [d]	8081/608	2 x 1-L amber G	Cool 4°C [e]	7 days to extraction and 40 days to analysis
	Solid	3540, 3550 [d]	8081	1 x 4-oz or 8-oz G	Cool 4°C	14 days to extraction and 40 days to analysis
Organochlorine Herbicides	Water	3510, 3520 [d]	8151	2 x 1-L amber G	Cool 4°C [e]	7 days to extraction and 40 days to analysis
	Solid	3540, 3550 [d]	8151	1 x 4-oz or 8-oz G	Cool 4°C	14 days to extraction and 40 days to analysis
Metals (except Mercury)	Water	3005, 3010	6010/6020/200.7	1 x 1-L HDPE	pH < 2 with HNO_3, Cool 4°C	6 months
	Solid	3050, 3051	6010	1 x 8-oz G	Cool 4°C	6 months
Waste Characterization Parameters						
Corrosivity (pH)	Aqueous Waste	NA	9040	250 mL HDPE	NA	24 hours
	Solid Waste Material	NA	9045	1 x 8-oz wide-mouth G	NA	24 hours
General Chemistry Parameters						
Ammonia	Water	NA	350.3	250 mL HDPE	pH < 2 with H_2SO_4, Cool 4°C	28 days
BOD	Water	NA	405.1	1 x 1-L HDPE	Cool 4°C	48 hours
Chloride	Water	NA	325.3/300.0/9056	250 mL HDPE/2 x 40 mL vial	Cool 4°C	28 days
COD	Water	NA	HACH 8000	125 mL HDPE	pH <2 with H_2SO_4	28 days
Fluoride	Water	NA	340.1/340.2	500 mL HDPE	Cool 4°C	28 days

Table 3. Summary of Methods, Containers, Preservatives, and Holding Times, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Matrix	Preparation Method	Analytical Method [a]	Container [b]	Preservative	Holding Time [c]
Nitrate	Water	NA	353.2/300.0/9056	250 mL HDPE/ 2 x 40 mL vial	Cool 4°C	2 days
Phosphorus (Total)	Water	NA	365.1/365.2/365.5	1 x 100 mL HDPE or G	pH < 2 with H_2SO_4	28 days
Sulfate	Water	NA	375.4/300.0/9056	250 mL HDPE/	Cool 4°C	28 days
Total Dissolved Solids (TDS)	Water	NA	160.1	500 mL HDPE	Cool 4°C	7 days
Total Suspended Solids TSS)	Water	NA	160.2	500 mL HDPE	Cool 4°C	7 days

(b) Sample volumes may be combined for MNA parameters where preservatives are the same and adequate sample volume is supplied to the laboratory. Volumes
(c) Maximum holding time allowed from date of collection.
(d) Cleanup methods may be applicable if matrix interference is encountered. Cleanup methods may include alumina (Method 3610), florisil (Method 3620), silica gel
(e) If residual chlorine is present, requires sodium thiosulfate in each sample container.
(f) Waste Characterization addresses solid (soils, sludge, waste) material analysis for waste disposal purposes. Liquid (aqueous or organic) wastes will be
(g) *This holding time is a contractual holding time that has been established by ARCADIS and is established in the USEPA Region 4 Laboratory Operations and*

°C	Degrees Centigrade.	mL	Milliliter.
BOD	Biological Oxygen Demand.	MNA	Monitored Natural Attenuation.
COD	Chemical Oxygen Demand.	NA	Not Applicable.
G	Glass.	oz	Ounce.
GPC	*Gel Permeation Chromatography.*	RCRA	*Resource Conservation and Recovery Act.*
H_2SO_4	Sulfuric Acid.	SVOCs	Semivolatile Organic Compounds.
HCl	Hydrochloric Acid.	TSS	Total Suspended Solids.
HDPE	High Density Polyethylene.	USEPA	U.S. Environmental Protection Agency.
HNO_3	Nitric Acid.	VOCs	Volatile Organic Compounds.
L	Liter.		

Table 4. Proposed Soil Sampling Parameters, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Analytical Method	Chemical of Concern	MDEQ Tier 1 TRG (Restricted Use) (mg/kg)
Volatile Organic Compounds (VOCs)	Method 8260	Benzene	1.36
		Bromodichloromethane	1.89
		Bromoform	90.1
		Carbon Tetrachloride	0.569
		Chloroform	0.478
		Dibromochloromethane	68.1
		1,2-Dichloroethane	0.621
		Methylene Chloride	21.9
		1,1,1,2-Tetrachloroethane	220
		Tetrachloroethene	18.2
		Trichloroethene	7.92
		1,2,4-Trimethylbenzene	102,000
		1,3,5-Trimethylbenzene	436
		Vinyl Chloride	0.939
Semivolatile Organic Compounds (SVOCs)	Method 8270	Acetophenone	2,630
		Atrazine	25.8
		bis-(2-Ethyl)hexyl Phthalate	409
		Cyanazine	6.81
		4-Nitrophenol	16,400
		Pentachlorophenol	23.8
Organochlorine Pesticides	Method 8081	Toxaphene	5.2
Organochlorine Herbicides	Method 8151	Dinoseb	204
Metals	Method 6010 or 6020	Arsenic	11.8

MDEQ Mississippi Department of Environmental Quality.
mg/kg Milligrams per kilogram.
TRG Target Remediation Goal.

Table 5. Proposed Groundwater Sampling Parameters, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Analytical Method	Chemical of Concern	MDEQ Tier 1 TRG (µg/L)
Volatile Organic Compounds (VOCs)	Method 8260	Benzene	5 (MCL)
		Bromodichloromethane	0.168
		Bromoform	8.48
		Carbon Tetrachloride	5 (MCL)
		Chloroform	0.155
		Dibromochloromethane	0.126
		1,2-Dichloroethane	5 (MCL)
		Methylene Chloride	5 (MCL)
		1,1,1,2-Tetrachloroethane	0.406
		Tetrachloroethene	5 (MCL)
		Trichloroethene	5 (MCL)
		1,2,4-Trimethylbenzene	12.3
		1,3,5-Trimethylbenzene	12.3
		Vinyl Chloride	2 (MCL)
Semivolatile Organic Compounds (SVOCs)	Method 8270	Acetophenone	0.0416
		Atrazine	3 (MCL)
		bis-(2-Ethyl)hexyl Phthalate	6 (MCL)
		Cyanazine	0.0797
		4-Nitrophenol	292
		Pentachlorophenol	1 (MCL)
Organochlorine Pesticides	Method 8081	Toxaphene	3 (MCL)
Organochlorine Herbicides	Method 8151	Dinoseb	7 (MCL)
Metals	Method 6010 or 6020	Arsenic	50 (MCL)

MCL Maximum contaminant level.
MDEQ Mississippi Department of Environmental Quality.
µg/L Micrograms per liter.
TRG Target Remediation Goal.

Table 6. Proposed Storm Water Sampling Parameters, Site Baseline Sampling Work Plan, Former Vicksburg Chemical Company, Vicksburg, Mississippi.

Parameter	Analytical Method	Chemical of Concern	Water Quality Limit (µg/L)
Analytical Parameters			
Volatile Organic Compounds (VOCs)	624	Benzene	PQL[1]
		Bromodichloromethane	PQL
		Bromoform	PQL
		Carbon Tetrachloride	PQL
		Chloroform	PQL
		Dibromochloromethane	PQL
		1,2-Dichloroethane	PQL
		Methylene Chloride	PQL
		1,1,1,2-Tetrachloroethane	PQL
		Tetrachloroethene	PQL
		Trichloroethene	PQL
		1,2,4-Trimethylbenzene	PQL
		1,3,5-Trimethylbenzene	PQL
		Vinyl Chloride	PQL
Semivolatile Organic Compounds (SVOCs)	625	Acetophenone	PQL
		Atrazine	PQL
		bis-(2-Ethyl)hexyl Phthalate	PQL
		Cyanazine	PQL
		4-Nitrophenol	PQL
		Pentachlorophenol	PQL
Organochlorine	608	Toxaphene	PQL
Organochlorine	8151	Dinoseb	PQL
Metals	200.7	Arsenic	PQL
Storm Water Parameters			
General Chemistry	350.3	Ammonia (as N)	PQL
	405.1	Biochemical Oxygen Demand (5-day)	PQL
	HACH 8000	Chemical Oxygen Demand	PQL
	325.3/300.0/9056	Chloride	75,000
	340.1/340.2	Fluoride (as F)	PQL
	353.2/300.0/9056	Nitrates (as N)	PQL
	9040	pH	PQL
	375.4/300.0/9056	Sulfate	120,000
	160.1	Total Dissolved Solids	400,000
	365.1/365.2/365.5	Total Phosphorus (as P)	PQL
	160.2	Total Suspended Solids	PQL
Organochlorine	608	Toxaphene	PQL
Organochlorine	8151	Dinoseb	PQL

(1) PQL to be used until final water quality regulatory limits for all chemicals of concern are presented in the forthcoming Agreed Order for Storm Water.

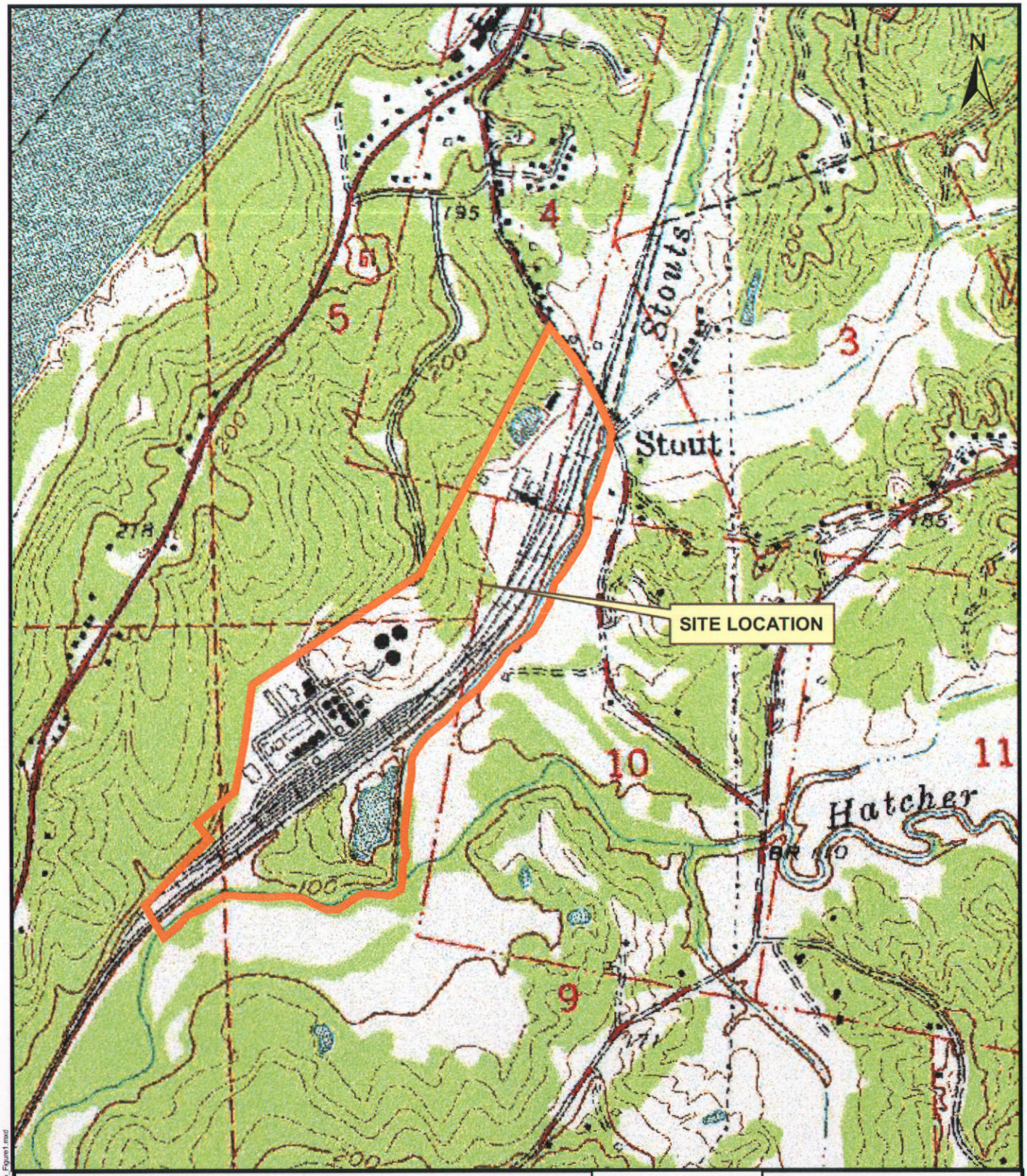
MCL Maximum contaminant level.

MDEQ Mississippi Department of Environmental Quality.

PQL Practical Quantitation Limit.

TRG Target Remediation Goal.

µg/L Micrograms per liter.



Former Plant Site

Note: Approximate Property Boundary

ARCADIS
10352 Plaza Americana Drive
Baton Rouge, Louisiana 70816
Tel: 225.292.1004 Fax: 225.218.9677

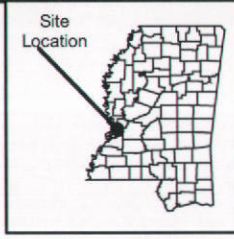
REFERENCE:

USGS, Vicksburg West Quadrangle, Mississippi
7.5 Minute Series (Topographic)

SITE LOCATION MAP

VICKSBURG CHEMICAL COMPANY

VICKSBURG, MISSISSIPPI



500 0 500 1,000 Feet

Project Manager: JE	Completed By: AB
Task Manager: CD	Date: 07/31/2006
Project No.: LA002656.0001	Figure No.: 1

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U:\projects\Vicksburg\LA002656.0001.00002\plotfiles\Vicksburg_SiteMap.pdf

LEGEND

- PROPOSED SOIL SAMPLING LOCATIONS
- ARSENIC AND TOXAPHENE CONTAMINATION FOUND WITHIN INVESTIGATED BOUNDARIES
- SOIL/SLUDGE CONTAINING VOCs
- ARSENIC CONTAMINATION FOUND WITHIN INVESTIGATED BOUNDARIES
- CONCENTRATION OF CONTAMINATION EXCEEDS VALUES IN MDEQ TIER I TRG TABLE
- TOXAPHENE CONTAMINATION FOUND WITHIN INVESTIGATED BOUNDARIES
- DINOSEB AND TOXAPHENE CONTAMINATION FOUND WITHIN INVESTIGATED BOUNDARIES

AREA 1 – SWMU 1, 5, 7, 8, 9, 11, 12, 14, 15, 16, AND 17
AREA 2 – SWMU 20 (SW CORNER)
AREA 3 – SWMU 2
AREA 4 – SWMU 20 (AREA BOUNDED BY MW-13, MW-14, AND MW-1)
PROPOSED SOIL SAMPLE LOCATION
AREA 5 – SWMU 23

0 200' 400' 800'

DRAWN BY: S. MEN	CHECKED: CAD
PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
DATE: 11-6-06	TASK/PHASE NUMBER: 0007

ARCADIS
10352 PLAZA AMERICANA DRIVE
BATON ROUGE, LA 70816
TEL: 225-292-1004
FAX: 225-218-9677
WWW.ARCADIS-US.COM

PROPOSED SOIL SAMPLING LOCATIONS

FORMER VICKSBURG CHEMICAL COMPANY SITE

PROJECT NUMBER: LA002656.0001

DRAWING NUMBER: 2

LEGEND

MW16 MONITORING WELL LOCATION

0 200' 400' 800'

DRAWN BY: D. EKINIA	CHECKED: CAD
PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
DATE: 12-14-06	TASK/PHASE NUMBER: 0007

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MONITOR WELL LOCATIONS

FORMER VICKSBURG CHEMICAL COMPANY SITE

PROJECT NUMBER: LA002656.0001

DRAWING NUMBER: 3

LEGEND

10-FOOT CONTOUR INTERVAL

2-FOOT CONTOUR INTERVAL

PROPOSED STORM WATER SAMPLING LOCATION

0 200' 400' 800'

DRAWN BY: S. MEN	CHECKED: CAD
PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
DATE: 10-26-06	TASK/PHASE NUMBER: 0007

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PROPOSED STORM WATER SAMPLING LOCATIONS

FORMER VICKSBURG CHEMICAL COMPANY SITE

PROJECT NUMBER: LA002656.0001

DRAWING NUMBER: 4

Appendix A

Sample Core Log

ARCADIS G & M, Inc.
10352 Plaza Americana Drive
Baton Rouge, LA 70816

SAMPLE / CORE LOG

Boring/Well: _____ **Project No.:** _____

Site Location: _____ **Drilling Started:** _____ **Drilling Completed:** _____

Land-Surface Elev.: _____ **Surveyed:** ____ **Estimated:** ____ **Datum:** _____

Drilling Fluid: _____ **Drilling Method Used:** _____

Drilling Contractor: _____ **Driller:** _____ **Helper:** _____

Prepared By: _____ **Hammer Weight:** _____ **Hammer Drop (inches):** _____

Fill | Silty Clay | Silt | Sandy Silt | Silty Sand | Acetate Sleeve | Water First Encountered

Clay | Sandy Clay | Clayey Silt | Sand | Clayey Sand | Split Spoon | Water Level After 10 Minutes

SAMPLE DEPTH (ft)	SAMPLE TYPE	RECOVERY (ft)	SYMBOL	VISUAL DESCRIPTION	USCS (LL/PL/PI)	PP H	PP V	OVA (wo/F)(ppm)	OVA (w/F)(ppm)	REMARKS
0										
1										
2										
3										
4										
5										
6										
7										
8										
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23										
24										
25										

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Appendix B

Water Sampling Log

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WATER SAMPLING LOG

Project _____ Project No. _____

Site Location _____ Date: _____

Site/Well No. _____ Replicate No. _____ Code No. _____

Weather _____ Sampling Time: Begin _____ End _____

Evacuation Data

Measuring Point _____

MP Elevation (ft) _____

Land Surface Elevation (ft) _____

Sounded Well Depth (ft bmp) _____

Depth To Water (ft bmp) _____

Water Level Elevation (ft) _____

Water Column In Well (ft) _____

Casing Diameter/Type _____

Gallons In Well _____

Gallons Pumped/Bailed *Prior To Sampling* _____

Sample Pump Intake Setting (ft bmp) _____

Purge Time Begin _____ End _____

Pumping Rate (gpm) _____

Evacuation Method _____

Field Parameters

Color _____

Odor _____

Appearance _____

pH (s.u.) _____

Conductivity (ms/cm) _____

Conductivity (µmhos/cm _____

Turbidity (NTU) _____

Temperature (^{O}C/ ^{O}F) _____

Dissolved Oxygen (mg/L) _____

ORP (mV) _____

Sampling Method _____

Remarks _____

Constituents Sampled	Container Description	Number	Preservative

Sampling Personnel _____

Well Casing Volumes

Gal./Ft. 1" = 0.04 | 1 - 1/4" = 0.06 | 1 - 1/2" = 0.09 | 2" = 0.16 | 2 - 1/2" = 0.26 | 3" = 0.37 | 3 - 1/2" = 0.50 | 4" = 0.65 | 6" = 1.47

bmp	Below measuring point	ml	Milliliter	NTU	Nephelometric Turbidity Units
^{O}C/^{O}F	Degrees Celsius/Fahrenheit	mS/cm	Millisiemens per centimeter	PVC	Polyvinyl chloride
ft	Feet	msl	Mean sea level	s.u.	Standard units
gpm	Gallons per minute	NA	Not Applicable	µmhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds
ppt	Parts per thousand	CS	Carbon steel	SS	Stainless steel

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Appendix C

Historical Monitor Well Network

TABLE 1

GROUNDWATER DATA LEVEL MEASUREMENTS

Piezometer or Well Number	Casing Elevation (ft msl)	Bottom Elevation (ft msl)	Top of Screen (ft msl)	November 1993 Groundwater Elevation (ft msl)
MW 1 A	113.01	83.01	93.51	108.39
MW 2	108.21	68.21	78.71	98.87
MW 3	99.33	69.33	79.83	
MW 4	114.70	94.70	105.20	106.89
MW 5	100.30	80.30	85.80	84.01
MW 6	100.76	73.78	79.28	86.48
MW 7	99.66	69.33	74.83	92.39
MW 8	110.83	80.83	86.33	103.14
MW 9	116.02	58.02	73.02	110.89
MW 10	114.73	61.73	74.73	107.40
MW 11	105.62	57.62	70.62	98.16
MW 12	112.06	64.56	80.06	109.32
MW 13	113.52	63.52	73.52	109.51
MW 14	113.9	57.9	67.9	107.64
MW 15	Plugged and abandoned during surface impoundment retrofit			
MW 16	111.84	58.84	68.84	108.84
PZ 12A (R)	137.87	66.97	72.97	107.64
PZ 12B (R)	137.27	105.27	111.27	123.48
PZ 19A	140.34	64.34	70.34	107.59
PZ 19B	140.22	120.22	126.22	124.46
PZ 20A	136.25	65.25	71.25	107.68
PZ 20B	136.43	103.43	109.43	114.50
PZ 21A	115.22	61.22	67.22	107.75
PZ 22A	112.71	61.71	67.71	107.11
PZ 22B	113.51	88.17	94.17	108.17
PZ 23A	112.49	66.49	72.49	107.27
PZ 23B	113.10	91.10	97.10	109.79
PZ 24B	113.16	85.16	91.16	107.21
PZ 25B	113.96	77.96	83.96	110.44

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Appendix D

Monitor Well Inspection Checklist

MONITOR WELL INSPECTION CHECKLIST

Project Name: _____ Project Number: _____

Inspectors Name: _____ Inspection Date: _____

Monitor Well ID: _____ Site Location: _____

Type of Well: ☐ Flush Mounted ☐ Above Grade

A. Condition of protective casing: _____

B. Condition of concrete pads (note cracks, breaks, slope direction): _____

_____

C. Condition of guard posts: _____

D. Is the well locked? _____

E. Is well identification number clearly marked? _____

F. Is the TOC elevation mark clearly visible on the well ? _____

G. Condition of well casing: _____

H. Condition of well cap: _____

I. Condition of surrounding grounds (i.e., overgrowth, is the well accessible, etc.): _____

J. Does water adequately drain from the well site?: _____

K. Total depth of well (properly decon tape between wells). _____

_____

L. Depth to top of grout from protective casing - length of protective casing above concrete pad: _____

M. Comments/Recommendations: _____

_____

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Appendix E

Remedial Site Conceptual Exposure Model

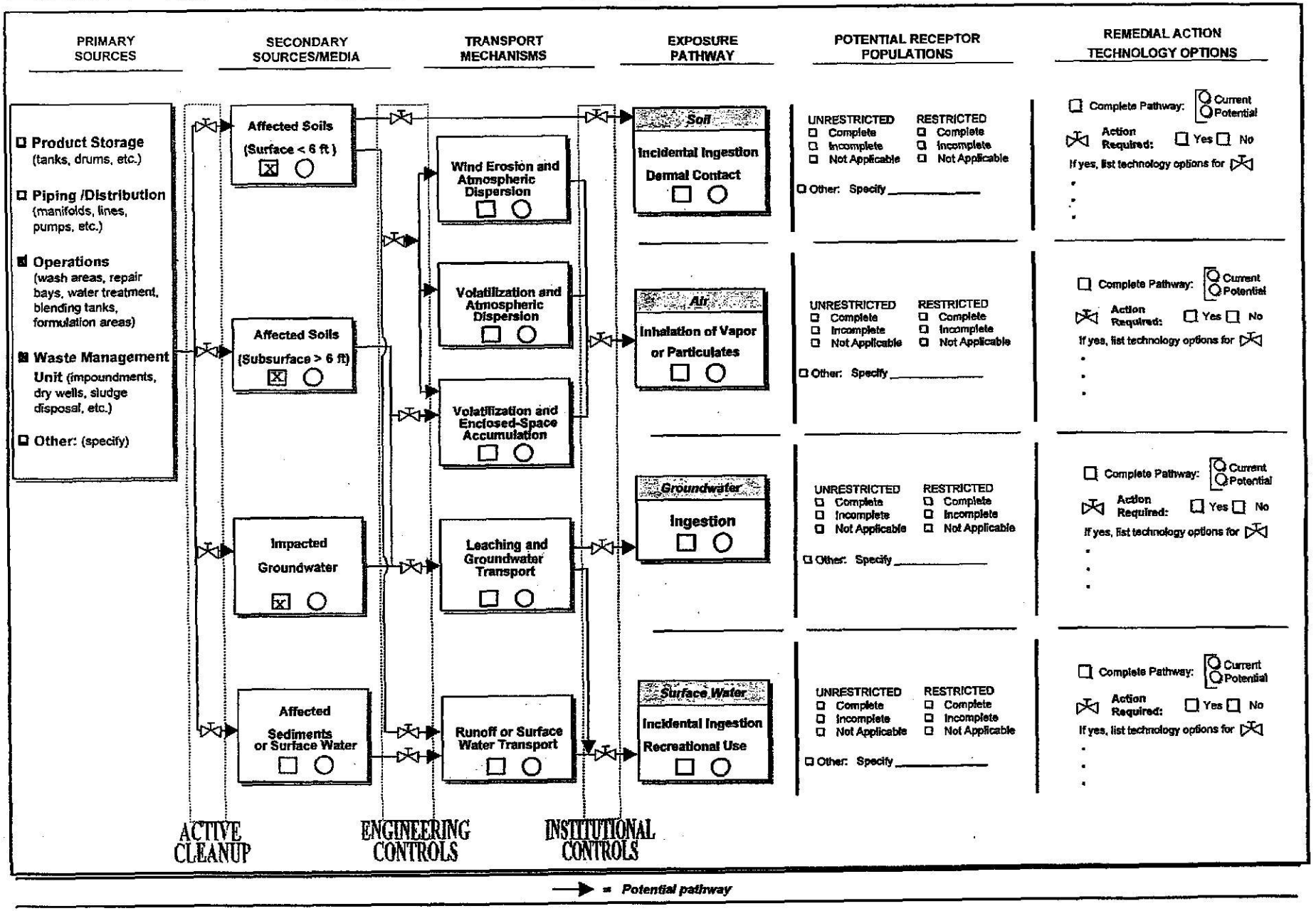
Worksheet

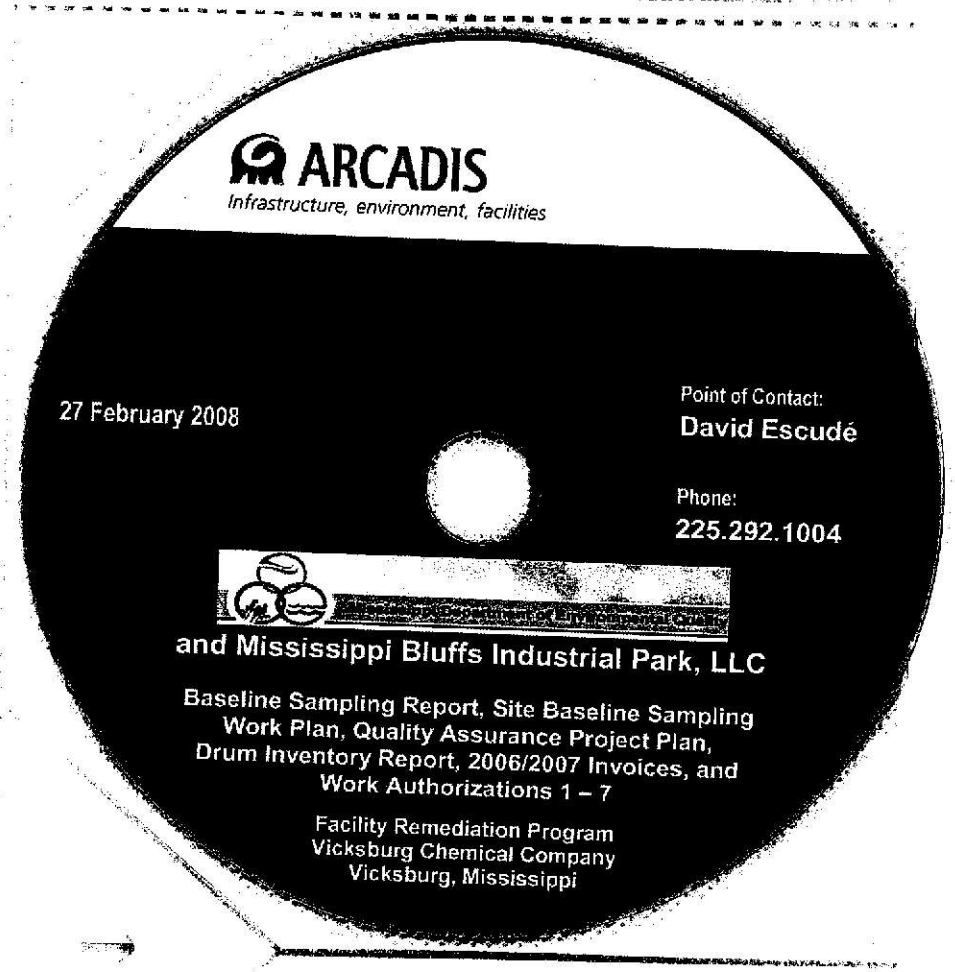
Remedial Site Conceptual Exposure Model (SCEM)

Site Name: Former Vicksburg Chemical Company
Site Location: Vicksburg Mississippi

Completed By: Craig Derouen
Revision Date: 11/20/06

☐ Complete ○ Potentially Complete ☒ Draft ☐ Final

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and Mississippi Bluffs Industrial Park, LLC
Baseline Sampling Report, Site Baseline Sampling Work Plan, Quality Assurance Project Plan, Drum Inventory Report, 2006/2007 Invoices, and Work Authorizations 1 – 7
Facility Remediation Program
Vicksburg Chemical Company
Vicksburg, Mississippi